भारतीय मानक

Indian Standard

IS 5914 (Part 4) : 2023
ISO 2420 : 2017

चमड़े की भौतिक परीक्षण पद्धतियाँ

भाग 4 प्रति इकाई क्षेत्र में स्पष्ट घनत्व और द्रव्यमान का निर्धारण

Methods of Physical Testing of Leather

Part 4 Determination of Apparent Density and Mass Per Unit Area

ICS 59.140.30

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NATIONAL FOREWORD

This Indian Standard (Part 4) which is identical with ISO 2420 : 2017 'Leather — Physical and mechanical tests — Determination of apparent density and mass per unit area' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Leather, Tanning Materials and Allied Products Sectional Committee and approval of the Chemical Division Council.

The Indian Standard IS 5914 : 1970 Methods of physical testing of leather prescribes the methods for carrying out physical tests for all types of leathers. The Committee responsible for formulating this standard has decided to harmonize the methods of test prescribed in IS 5914 with those prescribed in ISO/IULTCS standards. Accordingly, the Committee decided to retain IS 5914 and publish the harmonized/ adopted test methods published by ISO/IULTCS in various parts of IS 5914 as this standard is widely recognized by the Indian Leather Industry.

The Committee further decided to publish the adopted/harmonized standards in the following manner:

a) Wherever an existing test method is being replaced by the corresponding ISO/IULTCS test method, the relevant part will be published as revision with the information in the national foreword about the method of IS 5914 being superseded; and
b) When a new test method is being incorporated in IS 5914 the same will be published as a new standard and as subsequent part of IS 5914.

This Indian Standard (Part 4) supersedes the following method of test prescribed in IS 5914 : 1970

a) LP : 5 Method for determination of apparent density

This part is an adoption of ISO 2420 : 2017 which specifies method for determining the apparent density and the mass per unit area of leather.

This standard has been published in several other parts. The other parts of this series are:

IS.No	*Title*
IS 5914	Methods of physical testing of leather:
Part 1 : 2018	Determination of water vapour absorption
Part 2	Determination of abrasion resistance,
Sec 1 : 2022	Taber method (*first revision*)
Sec 2 : 2017	Martindale ball plate method
Part 3	Determination of soiling,
Sec 1 : 2017	Rubbing (martindale) method
Sec 2 : 2017	Tumbling method
Part 5	Determination of tear load,
Sec 1	Single edge tear (*under preparation*)
Sec 2	Double edge tear (*under preparation*)
Part 6	Determination of flex resistance,
Sec 1	Flexometer method (*under preparation*)
Sec 2	Vamp flex method (*under preparation*)

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Indian Standard

METHODS OF PHYSICAL TESTING OF LEATHER

PART 4 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.

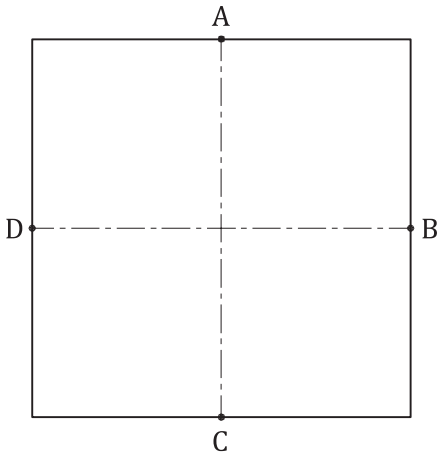

Figure 1 — Measurement of distances on square test pieces

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):

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

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):

$$m_a = \frac{10^6 \times m}{a \times b} \quad (4)$$

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.

(*Continued from second cover*)

IS No.	*Title*
Part 7	Determination of resistance to grain cracking and grain crack index (*under preparation*)

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions and terminologies are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words `this document' appear referring to this standard, they should be read as `Indian Standard'; and
b) Comma (,) has been used as a decimal marker in the International Standard, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The technical committee has reviewed the provisions of the following International Standards referred in this standard and has decided that they are acceptable for use in conjugation with this standard:

International Standard	*Title*
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

Conditioning and test atmospheres stipulated in this standard may not be applicable to tropical/subtropical countries like India. The applicable Standard Atmospheric Conditions (SAC) for Indian Conditions are (27 ± 2) ºC and (65 ± 5) percent relative humidity and may be observed while using this standard.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in

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Amendments Issued Since Publication

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