INTERNATIONAL STANDARD

ISO 14268

IULTCS/IUP 15

Second edition
2012-11-01

Leather — Physical and mechanical tests — Determination of water vapour permeability

Cuir — Essais physiques et mécaniques — Détermination de la perméabilité à la vapeur d'eau

Reference number
ISO 14268:2012(E)
IULTCS/IUP 15:2012(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 14268 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 289, *Leather*, in collaboration with the Physical Tests Commission of the International Union of Leather Technologists and Chemists Societies (IUP Commission, IULTCS), in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

The first edition was based on IUP 15 originally published in *J. Soc. Leather Trades Chemists*, **44**, p. 502, (1960) and declared an official method of the IULTCS in 1961. An updated version was published in *J. Soc. Leather Tech. Chem*., **82**, p. 234, (1998) and a further revision published in *J. Soc. Leather Tech. Chem.*, **84**, p. 353, (2000) and reconfirmed as an official method in March 2001.

This second edition cancels and replaces the first edition (ISO 14268:2002), which has been technically revised.

IULTCS, originally formed in 1897, is a worldwide 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.

Leather — Physical and mechanical tests — Determination of water vapour permeability

1 Scope

This International Standard describes a method for determining the water vapour permeability of leather and provides alternative methods of sample preparation.

2 Normative references

The following referenced documents are indispensable for the application 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*

ISO 5402-1, *Leather — Determination of flex resistance — Part 1: Flexometer method*

3 Principle

The test piece is clamped over the opening of a container which contains a solid desiccant and is placed in a strong current of air in a standard atmosphere. The air inside the container is constantly agitated by the desiccant which is kept in motion by the rotation of the container. The container is weighed at the start and the end of the test and the mass of moisture which has been absorbed by the desiccant is determined from the difference.

4 Apparatus

4.1 Containers, in the form of jars or bottles, with a neck of internal diameter 30 mm ± 3 mm fitted with a screw top with a circular opening whose diameter is equal to the internal diameter of the neck. Suitable containers typically have a height range of 70 mm to 90 mm.

4.2 Test machine, including the following:

4.2.1 Vertically mounted turntable, rotating at 75 r/min ± 5 r/min, capable of holding containers (4.1) with their axis parallel to and 67 mm ± 2 mm from the axis of rotation of the turntable.

4.2.2 Fan, mounted in front of the mouths of the containers consisting of three flat blades in planes that are inclined 120° to one another. The planes of the blades pass through the prolongation of the axis of the vertically mounted turntable (4.2.1). The blades are of approximate dimensions 90 mm × 75 mm and the 90 mm side nearest the mouths of the jars passes them at a distance of 10 mm ± 5 mm. The fan rotates at 1400 r/min ± 100 r/min with the direction of rotation being opposite to that of the vertically mounted turntable. The general arrangement of the turntable and fan are as shown in Figure 1.

4.3 Self-indicating silica gel desiccant, particle size 2 mm to 5 mm sieved to remove small particles and dust, and freshly regenerated by heating in a ventilated oven for at least 16 h at 125 °C ± 5 °C, then cooling to standard temperature in a hermetically sealed vessel. The granular size of the crystals shall be such that they shall not pass through a 2 mm sieve. The silica gel shall not be used if it is warmer than the test piece.

NOTE 1 Silica gel beads are preferred to granules as they generate less dust.

NOTE 2 Large volumes of silica gel will only cool slowly in a closed vessel. A long cooling time may be needed to ensure that all the silica gel has cooled to standard temperature.

4.4 Balance, weighing to 0,001 g.

4.5 Stop clock, reading to 1 min.

4.6 Vernier callipers, reading to 0,1 mm and capable of measuring the internal diameter of the necks of the containers.

4.7 Press knife, as specified in ISO 2419, capable of cutting circular test pieces of a suitable size to allow a good seal at the open end of the container (4.1).

4.8 Beeswax.

4.9 Abrasive paper, grade P180.

Dimension in millimetres

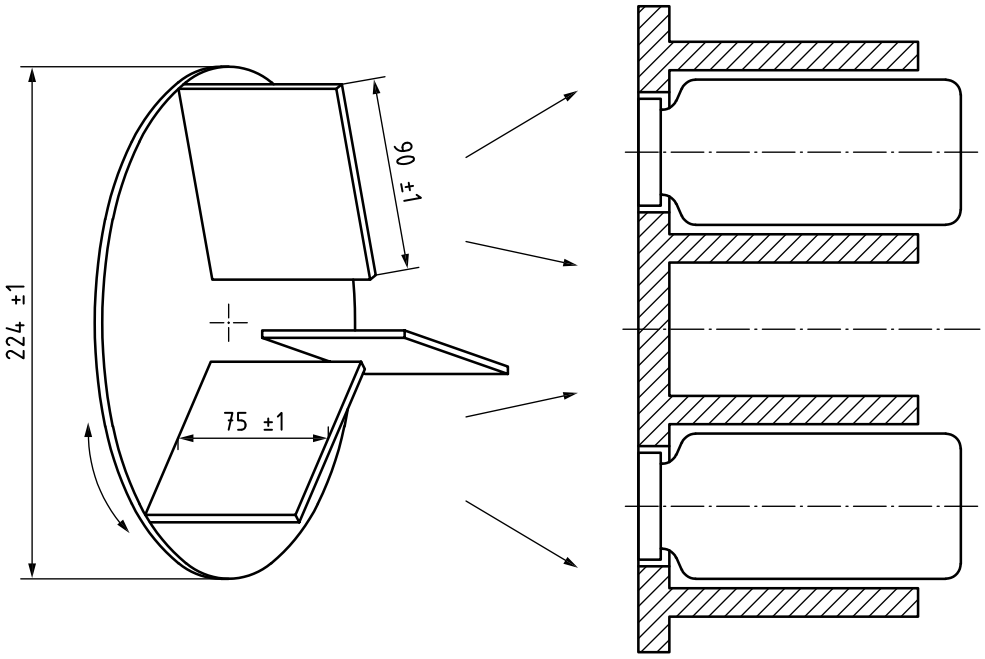

Figure 1 — General arrangement of test machine

4.10 Flex machine, as specified in ISO 5402-1, if test pieces are to be subjected to flexing prior to test.

5 Sampling and sample preparation

5.1 Sample in accordance with ISO 2418. Cut three test pieces by applying the press knife (4.7) to the grain surface.

If necessary, determine the thickness, as specified in ISO 2589, to ensure test pieces are below 3,0 mm thickness.

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

5.2 Prepare the three test pieces by one of the following methods; if no pre-treatment is specifically required then procedure c) is the preferred method:

a) Cut a square piece of minimum size 50 mm. Place the piece grain upwards on a flat surface, press a piece of P180 grade abrasive paper (4.9) against the leather and draw it across the leather 10 times in various directions under a load of about 2 N applied by hand pressure. Cut a circular test piece from the buffed area using the press knife specified in 4.7.

b) Flex a sample for 20 000 cycles using the method and apparatus specified in ISO 5402-1. Cut a circular test piece from the flexed area using the press knife specified in 4.7.

c) Cut a test piece using the press knife specified in 4.7.

Many leathers have on the grain a surface coat which reduces the water vapour permeability of the leather, but which has less effect after the coat has been flexed or exposed to slight abrasive action. The treatments specified in a) and b) are intended to simulate the abrasion which the leather would receive in wear. If no pre-treatment is required, method c) may be used, and this option can be preferable for suede and unfinished leathers.

5.3 Condition the test specimens (5.2) in accordance with ISO 2419 and carry out the test in the standard atmosphere.

6 Procedure

6.1 Half fill a container with freshly regenerated silica gel.

6.2 Place a test piece centrally over the open container so that the surface which is exposed to the higher humidity when the final product is in use is uppermost.

6.3 Fit a screw top to the container and tighten so that the test piece is securely held around the edge and the container is sealed. If it is necessary to seal the junction between the test piece and the neck of the jar, warm the bottle and apply a thin layer of beeswax (4.8) to the flat surface of the neck. If the opening of the jar has been coated with beeswax, warm to (50 ± 5) °C before introducing the silica gel and fixing the test piece.

6.4 Place the container on the turntable (4.2.1) and start the test machine.

NOTE It might be necessary to use additional containers made up as in 6.1 to 6.3 to ensure that the turntable is balanced.

6.5 Using vernier callipers (4.6), measure the internal diameter of the neck of a second container (to the nearest 0,1 mm) in two mutually perpendicular directions and calculate the mean diameter.

6.6 After 20 h $\pm$ 4 h, remove the first container from the test machine then, as rapidly as possible, half fill the second container with freshly regenerated silica gel. Remove the test piece and screw top from the first container, place them on the second container (keeping the same side facing outwards) and weigh the second container with the silica gel and test piece. Record the mass (m_0).

6.7 If the test piece is approximately 3 mm in thickness or is heavily embossed or is expected to have a vapour permeability below 5 mg/(cm^2 h), the end surface of the neck of the second container, taken in 6.5, should be dipped in melted beeswax. Afterwards, half fill the second container with freshly regenerated silica gel. Remove the test piece and screw top from the first container, place them on the second container

(keeping the same side facing outwards) and weigh the second container with the silica gel and test piece. Record the mass (m_0).

6.8 Replace the container on the vertical turntable and start the test machine and stop clock.

6.9 After 11,5 h ± 4,5 h, stop the test machine and note the time.

6.10 Remove the container and reweigh it. Record the mass (m_1).

7 Expression of results

Calculate the water vapour permeability, P_{wv}, in milligrams per square centimetre hour, using the following equation.

$$P_{wv} = \frac{7\,639\Delta m}{d^2 t}$$

where

Δm is the increase in mass of the container ($m_1 - m_0$), in milligrams;

d is the mean diameter of the neck of the container, in millimetres;

t is the time between the first and second weighing, in minutes.

NOTE The constant 7 639 arises from the conversion of the diameter (measured in millimetres) to a radius in centimetres, the time (measured in minutes) to hours and the constant π, as follows:

$$7\,639 = \frac{(20)^2 \times 60}{\pi}$$

8 Test report

The test report shall include the following:

a) reference to this International Standard, i.e. ISO 14268;

b) the mean water vapour permeability, $\bar{P}_{wv}$, in milligrams per square centimetre hour, expressed to one decimal place;

c) the preparation given to the test piece in 5.2;

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

e) any deviations from the method specified in this International Standard;

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

Annex A
(informative)

Sources of apparatus

Examples of suitable products available commercially are given below. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

The recommended apparatus is the Nice-Mitton permeability apparatus manufactured for example by:

SATRA Technology Centre, Wyndham Way, Telford Way, Kettering, Northants, NN16 8SD England, www.satra.co.uk ;

Giuliani Apparecchi Scientifici, via Centrallo, 68/18, I-10156 Torino, Italy, www.giuliani.it ;

EMI Groupe Prodys Equipment, 9 chemin des Pres, Zirst 4403, F-38944 Meylan, France, www.emi-developpement.com ;

Muver - Francisco Muñoz Irles, Avda Hispanoamerica 42, E-03610 Petrer (Alicante), Spain, www.muver.com

PFI, Test and Research Institute, Marie-Curie-Straße 19, D-66953 Pirmasens, Germany, www.pfi-germany.de

Annex B
(informative)

Water vapour number

It is common practice to combine the results of water vapour permeability, P_{wv}, ISO 14268, and water vapour absorption, A_{wv}, ISO 17229, to determine the water vapour number, W_{pn}.

Calculate the water vapour number, W_{pn}, in milligrams per square centimetre 8 hours, using the following equation:

$$W_{pn} = \left(t \times P_{wv}\right) + A_{wv}$$

where

t is 8 h;

P_{wv} is the water vapour permeability;

A_{wv} is the water vapour absorption.

Bibliography

[1] ISO 17229:2002, *Leather — Physical and mechanical tests — Determination of water vapour absorption*

ICS 59.140.30

Price based on 7 pages