INTERNATIONAL STANDARD

ISO 7229

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Rubber- or plastics-coated fabrics — Measurement of gas permeability

Supports textiles revêtus de caoutchouc ou de plastique — Mesure de la perméabilité aux gaz

Reference number
ISO 7229:1997(E)

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.

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.

International Standard ISO 7229 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

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Rubber- or plastics-coated fabrics – Measurement of gas permeability

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This International Standard specifies a method of measuring gas transmission through fabrics coated with plastics or rubber, a property known as permeability.

It is particularly applicable

— when the anticipated permeability is less than 3 $dm^3/(d \cdot m^2)$ (cubic decimetres per day per square metre);

— when particular temperature or pressure conditions are required;

— when the measurement requires the use of particular gases, either in the pure state or as a mixture.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2231:1989, *Rubber- or plastics-coated fabrics — Standard atmospheres for conditioning and testing.*

ISO 2286-1:—[1], *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 1: Method for determination of the length, width and net mass of a roll.*

ISO 3601-1:1988, *Fluid systems — Sealing devices — O-rings — Part 1: Inside diameters, cross-sections, tolerances and size identification code.*

3 Principle

A test piece is placed between two parts of a hermetically sealed measurement cell. One surface of the test piece, chosen for convenience, is subjected to the constant pressure of a tracer gas while the other is in contact with a vector gas flowing at a constant rate into the cell. An analyser system at the cell outlet measures the concentration of the tracer gas in the vector gas, from which the permeability of the test piece to the tracer gas is then determined.

1) To be published. (Revision, in parts, of ISO 2286:1986)

4 Apparatus (see figure 1)

4.1 Measurement cell, with a useful diameter (O-ring diameter) of 113 mm and consisting of two interlocking sections (see figure 2). The materials of which it is made shall be inert to the gases used; in particular, they shall not retain these gases. The exact dimensions of the O-ring shall be chosen from those given in ISO 3601-1.

4.2 Flow meter: The choice of flow meter depends on the desired sensitivity which depends in turn on the sensitivity of the sensor. The latter shall have an accuracy better than 3 %.

4.3 Analyser system: The choice of analyser depends on technical and economic considerations (it is difficult to detect gases in concentrations lower than 100 ppm or 10^{-4}). It shall have an accuracy better than 5 %.

NOTE 1 — The analyser system may be a cathetometer or any other system with the desired characteristics capable of carrying out the measurements.

4.4 Gas supplies: Unless otherwise specified, the tracer gas shall be helium. In this case, the vector gas shall be nitrogen.

NOTE 2 — Tracer gases composed of a known mixture of pure gases may be specified, in which case the vector gas will have to be selected taking this into account.

4.5 Conditioning enclosure, into which the measurement cell may be put in order to ensure temperature control during the test.

5 Test pieces

5.1 Five test pieces shall be taken from the usable width, as defined in ISO 2286-1, of a sheet of the fabric.

5.2 The test pieces shall be circular with a diameter of 130 mm ± 2 mm.

6 Conditioning

Condition the test pieces in one of the standard atmospheres specified in ISO 2231. Atmospheric pressure is the reference pressure.

7 Test atmosphere

Unless otherwise specified, carry out the test at 23 °C ± 2 °C and at ambient atmospheric pressure.

Particular temperature or pressure conditions may be applied. These conditions shall be the subject of a prior agreement.

NOTE 3 — Since the test pieces are placed in a hermetic enclosure, the concept of relative humidity is irrelevant to the test.

8 Procedure

8.1 Insertion of test piece

Place a test piece on the lower section of the measurement cell, put the upper part in position and fit the entire unit together.

NOTE 4 — It is sometimes necessary to lubricate or grease the O-rings slightly in order to improve their contact with the test piece.

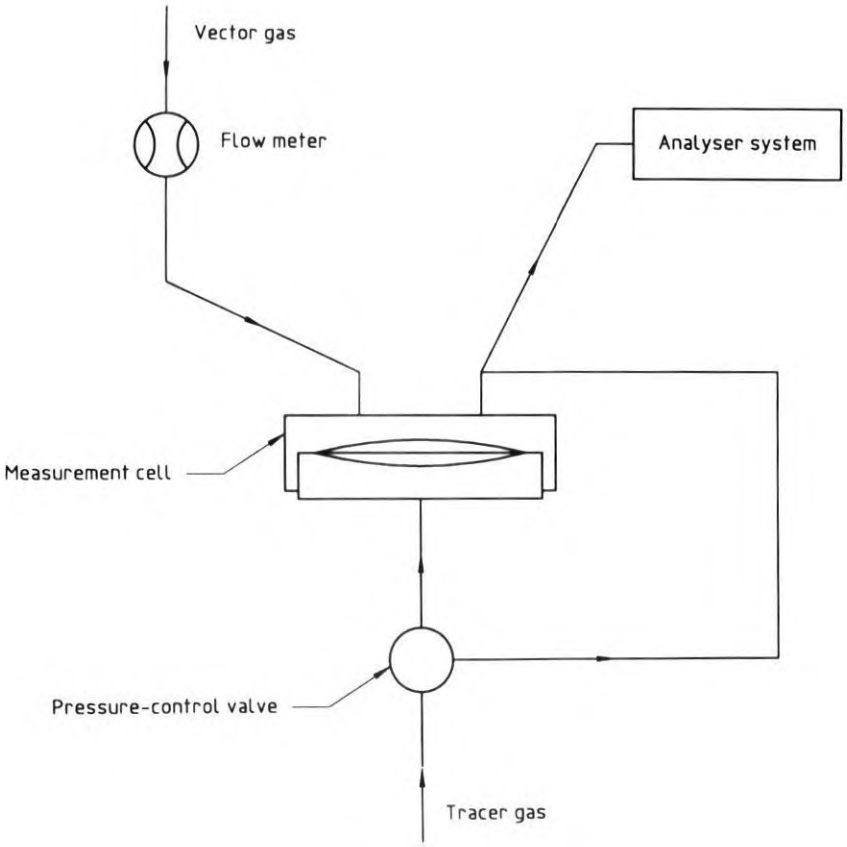
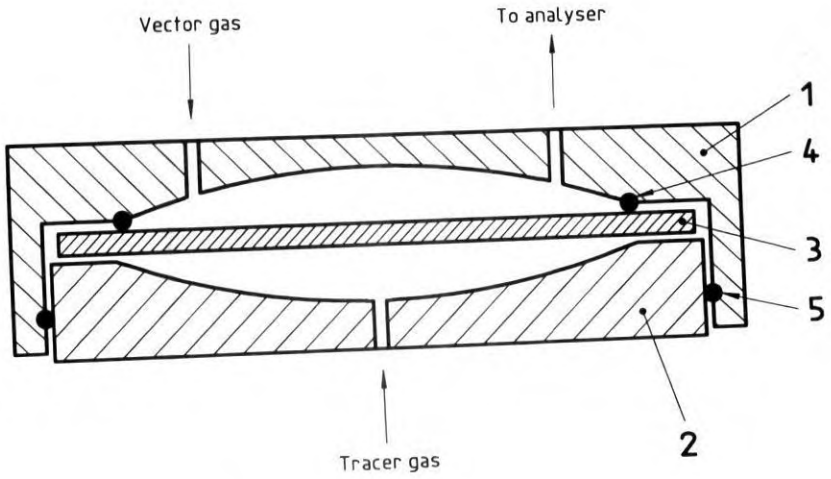


Figure 1 — Apparatus (schematic diagram)



1) Upper part of cell
2) Lower part of cell (∅ 130 mm)
3) Test piece
4) O-ring seal (∅ 113 mm)
5) O-ring seal

NOTE — The clamping system is not shown.

Figure 2 — Measurement cell

8.2 Purging

Purge the two parts of the cell with a sufficient amount of gas.

8.3 Gas supplies

Supply the vector gas at a constant rate (the rate will partly depend on the concentration).

Regulate the tracer gas pressure to obtain the specified pressure difference between the two cell sections.

NOTE 5 —The concentration measurements stabilize fairly rapidly (the period of time taken varies according to the ambient conditions). It is accepted that a variation of less than 5 % in 30 min indicates that stabilization has taken place.

9 Expression of results

The sensor measures the concentration C of the tracer gas in the vector gas and the flow meter measures the flow rate q_V of the vector gas (in cubic decimetres per hour). The effective surface area S of the test piece is known (0,01 m^2).

The permeability of the material P, expressed in cubic decimetres per hour per square metre [$dm^3/(h \cdot m^2)$], is given by

$$P = \frac{C \cdot q_V}{S}$$

or

$$P = 100\, C \cdot q_V$$

where

C is the concentration, by volume, of the tracer gas in the vector gas;

q_V is the vector gas flow rate, in cubic decimetres per hour;

S is the effective surface area, in square metres, of the test piece (0,01 m^2).

The permeability may be expressed in terms of "per day" by multiplying by 24.

NOTE 6 — With an analyser system such as a chromatograph, the lowest measurable concentration may be 100 ppm (10^{-4}). With a vector gas flow of 1 dm^3/h, the minimum measurable permeability will then be 0,01 $dm^3/(h \cdot m^2)$ or 0,24 $dm^3/(d \cdot m^2)$.

10 Test report

The test report shall contain the following particulars:

a) a reference to this International Standard;

b) all details necessary for identification of the material tested;

c) the tracer gas and vector gas used, and the pressure difference employed;

d) if necessary, any special test conditions;

e) the results of the measurements on each test piece;

f) their mean value;

g) the type of O-ring used;

h) any deviation from the specified procedure.