INTERNATIONAL STANDARD

ISO 2965

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Materials used as cigarette papers, filter plug wrap and filter joining paper, including materials having a discrete or oriented permeable zone and materials with bands of differing permeability — Determination of air permeability

Matériaux utilisés comme papier à cigarettes, pour le gainage des filtres et comme papier manchette, y compris les matériaux possédant une zone perméable discrète ou orientée et les matériaux à bandes de perméabilité diverses — Détermination de la perméabilité à l'air

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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 2965 was prepared by Technical Committee ISO/TC 126, *Tobacco and tobacco products*, Subcommittee SC 1, *Physical and dimensional tests*.

This third edition cancels and replaces the second edition (ISO 2965:1997) which has been technically revised.

Introduction

Measurements of air permeability of materials used as cigarette papers have been made for many years. The methods have required development and change because of the changing nature of the paper products and changes in the magnitude of their air permeability.

This method has been developed with the technical resources of CORESTA (Cooperative Centre for Research Relative to Tobacco).

Materials used as cigarette papers, filter plug wrap and filter joining paper, including materials having a discrete or oriented permeable zone and materials with bands of differing permeability — Determination of air permeability

1 Scope

This International Standard specifies a method for the determination of air permeability (AP).

It is applicable to materials used as cigarette papers, filter plug wrap and filter joining paper, including materials having an oriented permeable zone or discrete permeable zones where the measured permeability is in excess of 10 $cm^3 \cdot (min^{-1} \cdot cm^{-2})$ at 1 kPa. In addition, it is applicable to banded cigarette papers, with bands of width $\geqslant$ 4 mm.

NOTE For an estimate of the air permeability of materials outside the scope of this International Standard, see Note 2 in 5.1.2 and Note 3 in 7.6.1.

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 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 3402, *Tobacco and tobacco products — Atmosphere for conditioning and testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
air permeability
AP
flow of air, measured in cubic centimetres per minute, passing through 1 cm^2 surface of the test piece at a measuring pressure of 1,00 kPa

NOTE The air permeability units are $cm^3 \cdot (min^{-1} \cdot cm^{-2})$ at 1 kPa.

3.2
measuring pressure
difference in pressure across the two faces of the test piece during the measurement

3.3
leakage
air flow unintentionally aspirated from the surrounding atmosphere or escaping into it through the sealing surface of the test piece holder and elsewhere

3.4
paper with uniformly distributed permeability
standard paper
paper with natural air permeability only

3.5
paper with oriented permeable zone
paper that has a continuous zone of higher air permeability obtained through perforation

3.6
paper with discrete permeable zone
paper that has higher air permeability obtained through perforation in discrete areas

3.7
banded paper
paper with bands of different air permeability

NOTE Papers of this type normally have bands with permeability significantly lower than that of the base paper.

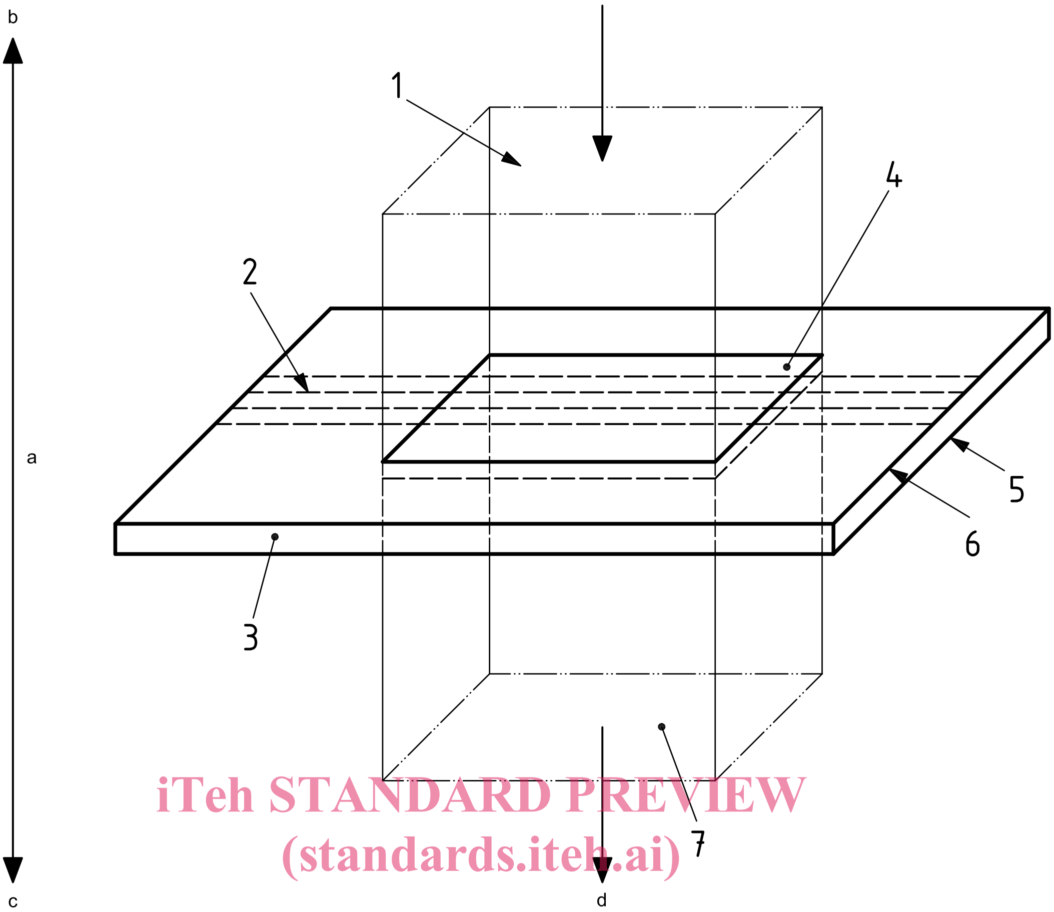
3.8
special paper
paper with modified air permeability

NOTE Papers of this type include those defined in paragraphs 3.5, 3.6 and 3.7.

4 Principle

A test piece is held in a suitable device. A pressure difference is applied across the test piece. The resultant flow of air through the test piece is measured.

The principle of measurement is illustrated in Figure 1.



Key

1 air stream
2 perforated zone (if present)
3 test piece
4 test surface of area (2 cm^2)
5 inner surface
6 outer surface
7 air stream

a Pressure difference.
b High pressure.
c Low pressure.
d Direction of air flow.

Figure 1 — Principle of measurement

The air flow through the test piece may be produced by applying a positive or negative pressure to one side of the test piece. The direction of air flow through the test piece shall be that which would occur when the sample is used in the finished product, where known, i.e. from the outside face towards the inside face.

If the air flow is produced by a positive pressure, the apparatus used should incorporate a filter which protects the test sample from contamination by oil, water and particles.

NOTE 1 With certain materials, the flow through the test piece can exhibit a non-linear relationship with the applied pressure drop. Thus the air flow through the test piece is determined at two pressure differences to establish whether the flow/pressure relationship across the paper is linear or non-linear. If it is non-linear, a second measurement of air flow is recorded at 0,25 kPa to fully characterize the material.

NOTE 2 Depending upon whether the volumetric air flow rate is measured up-stream or down-stream of the test piece, a difference of approximately 1 % of the flow rate can exist either side of the theoretical value at the centre of the test piece.

5 Apparatus

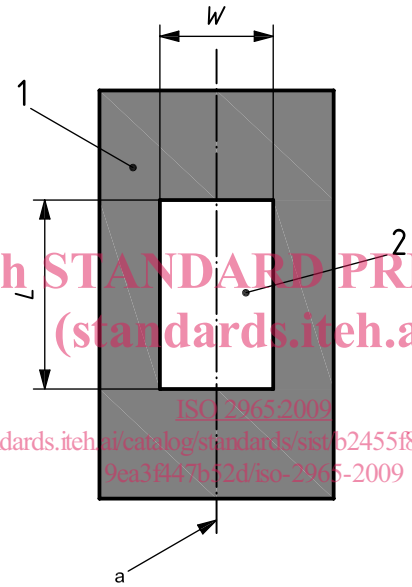
5.1 Test piece holder, for clamping the test piece, free from leaks.

5.1.1 For papers with uniformly distributed permeability and those with oriented or discrete permeable zones: the test piece holder has a rectangular surface area of 2,00 $cm^2 \pm 0,02$ cm^2 with corner radii no greater than 0,1 cm. The long side, L, shall have a length of 2,000 cm ± 0,005 cm (see Figure 2).

5.1.2 For bands of differing permeability: the test piece holder has a rectangular surface area of 0,30 $cm^2 \pm 0,01$ cm^2. The short side shall have a length of 2,00 mm ± 0,05 mm [see 7.5.6 and Figure 3 d)].

NOTE 1 The positioning of the test piece holder on the test piece differs for different types of papers (see 7.5 and Figures 2 and 3).

NOTE 2 An estimate of the air permeability of other speciality papers, outside the scope of this International Standard, may be required. In this case, specialized test piece holders with different surface areas might be necessary.



Key

1 test piece

2 measurement surface area of test piece holder

L is the long side of the test surface (see 5.1.1)

W is the width of the test surface

a Centreline of test piece.

Figure 2 — Positioning of test pieces for materials with uniformly distributed permeability

5.2 Pneumatic controller, to produce an air flow at a given but adjustable pressure difference between the two mating faces of the test piece holder.

5.3 Pressure gauge, suitable for measuring pressure differences to at least 0,001 kPa, having a relative error of no more than 2 % of the measured value within the measuring range.

5.4 Flow meter, suitable for measuring the air flow with a relative error no greater than 5 % of the measured value within the measuring range.

5.5 Conditioning enclosure, capable of maintaining the conditions given in ISO 187 (but see 7.3).

6 Sampling

Take a sample that is representative, on a statistical basis, of the population to be characterized.

Samples shall be free of visible defects and creases that may impair measurement performance.

7 Procedure

7.1 General

Since the pressure versus flow relationship of many papers is not linear, this procedure should be followed closely to allow proper comparison of results. If it is necessary to deviate from this procedure in any way (for example, to use a non-standard size of test piece holder or to modify the positioning of the test piece holder, due to sample dimensions) then this shall be noted in the Test Report [see 7.5 and 10 d)].

7.2 Leak check of the test piece holder

Follow the procedure given in Annex A. Perform a leak check daily, prior to use.

Air leaks between the mating faces of the test piece holder shall not be greater than 2,0 $cm^3 \cdot min^{-1}$.

Some users require determination of the effect of surface leakage through particular papers that contribute to the measured flow. In this case, if a value for leakage with the test piece in place is required, the procedure given in Annex C may be used. This should be determined and referred to in the test report.

7.3 Preparation of test pieces

Select at random from the sample, taken in accordance with Clause 6, the number of test pieces required for the test plus an additional three test pieces to be used as described in 7.6.1, Note 2.

If necessary make the test pieces suitable for testing (cut to the required dimensions, eliminate folds, seams, etc.).

Condition the test pieces, prior to measurement, in a conditioning enclosure set in accordance with ISO 187. Samples shall be held such that the conditioning air has free access to all their surfaces.

IMPORTANT — In laboratories unable to use the conditions given in ISO 187, the conditions given in ISO 3402 may be used. In these cases, a note shall be included with the test report.

NOTE Complete sample bobbins, where it is not possible to expose all surfaces to the conditioning atmosphere, might require an extended period of conditioning. The time required should be determined by practice and experience.

The period of time for conditioning is not given in this International Standard but the period of time retained should be reported with the results.

7.4 Calibration

Calibrate the instrument using the calibration standards and procedure referred to in Annex B.

7.5 Insertion of a test piece

7.5.1 General

All papers shall be placed in the test piece holder so that the measuring air will travel from the outside face towards the inside face of the paper as it is applied in the construction of the finished product, where this is known.

The positioning of the test pieces in the test piece holder is illustrated in Figures 2 and 3 (see also 5.1).

7.5.2 Materials with uniformly distributed permeability

Place in such a way that, if possible, the centre of the smaller dimension, W, of the test surface is at the centre of the width of the test piece (see Figure 2).

7.5.3 Materials with a narrow and oriented permeable zone

The permeable zone shall be oriented along, and parallel to, the direction of the 2 cm length of the test surface [see Figure 3 a)].

The edges of the permeable zone shall not be less than 1 mm from the edges of the test surface. Ideally, the test piece should extend over each edge of the test surface by at least 3 mm. If, for technical reasons, this cannot be achieved (i.e. the specimen under study is less than 16 mm total width or the permeable zone is less than 4 mm from one edge of the sample), this shall be referred to in the test report.

7.5.4 Materials with an extended and oriented permeable zone

The test piece holder shall be placed so that it covers the maximum possible width of the permeable zone and exposes the maximum possible permeable zone within the measurement surface area [see Figure 3 b)].

Ideally, the dimension L of the test surface shall extend at least 1 mm outside the edges of the permeable zone and the sample should extend over each edge of the test surface by at least 3 mm. Where this cannot be achieved (e.g. due to sample dimensions), this shall be referred to in the test report.

7.5.5 Materials with discrete permeable zones

The test piece shall be oriented so as to expose the greatest possible number of the permeable zones within the measurement surface area of the test piece holder [see Figure 3 c)].

Ideally, the 2 cm dimension of the test surface shall extend at least 1 mm outside the edges of the permeable zones and the sample should extend over each edge of the test surface by at least 3 mm. Where this cannot be achieved (e.g. due to sample dimensions), this shall be referred to in the test report.

7.5.6 Materials with bands of different air permeability

For measurement of the permeability of the bands, a 0,30 cm^2 test piece holder shall be used.

The test piece holder shall be oriented so that the long side of the test surface is parallel to the band and shall be positioned, as far as is practical, to centre the test surface within the band [see Figure 3 d)].

For measurement of the permeability of the base paper, a 2,00 cm^2 test piece holder shall preferably be used.

The test piece holder should be positioned between the bands so that the clamping face of the holder is at least 2,5 mm from the bands. It should be oriented so that the 2 cm dimension is parallel to the bands [see Figure 3 d)]. Where this is not possible, the size and orientation of the test piece holder used shall be noted in the test report.