

INTERNATIONAL STANDARD

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Paper and board — Determination of air permeance — Low range

*Papier et carton — Détermination de la perméabilité à l'air — Valeur
faible*



Reference number
ISO 11004:1992(E)

ISO 11004:1992(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 11004 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Sub-Committee SC 2, *Test methods and quality specifications for paper and board*.

Annex A forms an integral part of this International Standard. Annex B is for information only.

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Paper and board — Determination of air permeance — Low range

1 Scope

This International Standard specifies a method of determining the air permeance of paper and board in the low air permeance range.

The method is applicable to all papers and boards having an air permeance of less than $3 \times 10^{-1} \mu\text{m}/(\text{Pa}\cdot\text{s})$ when determined under the specified conditions. For air permeances greater than this, methods such as those specified in the ISO 5636 series are recommended (see annex B).

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 186:1985, *Paper and board — Sampling to determine average quality.*

ISO 187:1990, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 air permeance: The mean flow of air through unit area under unit pressure difference in unit time, under specified conditions.

It is expressed in micrometres per pascal second:

$$[1 \text{ ml}/(\text{m}^2\cdot\text{Pa}\cdot\text{s}) = 1 \mu\text{m}/(\text{Pa}\cdot\text{s})].$$

NOTE 1 Although the micrometre per pascal second is the standard unit for air permeance, because of the low air flows involved it may be more convenient to express the results in nanometres per pascal second:

$$[0,001 \text{ ml}/(\text{m}^2\cdot\text{Pa}\cdot\text{s}) = 1 \text{ nm}/(\text{Pa}\cdot\text{s})].$$

4 Principle

A test piece is clamped between circular plates and the air flow through the paper under specified conditions is measured.

5 Apparatus

5.1 Air-flow meter, consisting of three flowmeters covering a total range of 0,02 ml/s to 20 ml/s with an overlap between the flowmeters of at least 20 % of the full scale. Each flowmeter is calibrated to an error of less than 2 % of its full-scale value.

The flowmeters are fitted with stops for the rotors at both their upper and lower ends, the stops being designed to prevent interruption of the air flow.

The flowmeters are connected in series, the smallest first and the largest last, with its upper end open and air only being able to flow in the direction of the smallest to the largest.

NOTE 2 Some instruments are provided with a capillary air-flow meter to be used when testing very dense papers. The capillary, which is placed horizontally and is used in place of the flowmeters, is about 1 mm wide and has two marks about 200 mm apart. The volume between the two marks should be known with an error of less than 2 %. From a side tube, a droplet of butanol can be passed into the capillary tube by means of a rubber bulb and the time the droplet takes to pass between the two marks is used to determine the air flow.