

Methods for

Determination of water vapour transmission rate of sheet materials (paper and board) by dynamic sweep and static gas methods

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Paper and Printing Standards Policy Committee (PAM/-) to Technical Committee PAM/11, upon which the following bodies were represented:

- British Fibreboard Packaging Association
- British Paper and Board Industry Federation (PIF)
- British Printing Industries Federation
- British Telecommunications plc
- Envelope Makers' and Manufacturing Stationers' Association
- Her Majesty's Stationery Office
- Man-made Fibres Producers' Committee
- Ministry of Defence
- Paper Sack Development Association Ltd.
- PIRA (the Research Association for the Paper and Board, Printing and Packaging Industries)
- Post Office
- Society of British Printing Ink Manufacturers
- University of Manchester Institute of Science and Technology

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National foreword

This British Standard has been prepared under the direction of the Paper and Printing Standards Policy Committee. It is identical with ISO 9932:1990 “*Paper and board — Determination of water vapour transmission rate of sheet materials — Dynamic sweep and static gas methods*”, published by the International Organization for Standardization (ISO).

Cross-references

International Standard	Corresponding British Standard
ISO 186:1985	BS 3430:1986 <i>Method for sampling to determine the average quality of paper and board</i> (Identical)
ISO 187:1977	BS 3431:1973 <i>Method for the conditioning of paper and board for testing</i> (Technically equivalent)

The Technical Committee has reviewed the provisions of ISO 2528:1974, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard to ISO 2528:1974 is BS 3177:1959 “*Method for determining the permeability to water vapour of flexible sheet materials used for packaging*”.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard describes general test methods for determining the water vapour transmission rate of sheet materials by means of a dynamic gas method or a static gas method. Depending on the method and specific apparatus employed, materials up to 38 mm thick and with water vapour transmission rates in the range $0,05 \text{ g}/(\text{m}^2 \cdot \text{d})$ to $65 \text{ g}/(\text{m}^2 \cdot \text{d})$ can be tested. The basis of the function of the instrumental techniques is briefly described. Advice on calibration is given in Annex B.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions or 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 or the standards indicated below. Members of IEC and ISO maintain registers or currently valid International Standards.

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

ISO 187:1977, *Paper and board — Conditioning of samples*.

ISO 2528:1974, *Sheet materials — Determination of water vapour transmission rate — Dish method*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1

water vapour transmission rate

the mass of water vapour transmitted through unit area in unit time under specified conditions of temperature and humidity, it is expressed in grams per square metre per 24 h $[\text{g}/(\text{m}^2 \cdot \text{d})]$

3.2

dry side

that side or the test cell which is exposed to low humidity

3.3

wet side

that side of the test cell which is exposed to high humidity

4 Method A: Dynamic sweep gas method

4.1 Principle

The test piece is mounted between two chambers, one at a known relative humidity and the other swept by a dry gas. The amount of water vapour picked up by the dry gas stream is detected by an electrical sensor and converted to a reading which directly, or after calculation, is a measure of the rate of water vapour transmission through the test piece.

4.2 Apparatus¹⁾

4.2.1 Test cell, designed to clamp a test piece having a defined area, between two chambers, one swept by a dry gas (the dry side) and the other containing an atmosphere of high relative humidity (the wet side) (see Figure 1).

4.2.2 Clamping arrangements, to allow rapid insertion and removal of the test piece, equipped with suitable gaskets against which the test piece is sealed by the clamping force.

4.2.3 Provision for maintaining humidity on the wet side at the desired level. The required level of relative humidity may be obtained with saturated saline solutions containing a solid phase as described in Annex A or by distilled water if 100 % relative humidity is required.

4.2.4 Inert dry gas (as required by the specific apparatus to be used), for purging on the dry side.

NOTE 1 The gas is normally desiccated air or dry nitrogen.

4.2.5 Sensor, with rapid response and high sensitivity capable of detecting levels in the moisture content of the sweep gas equivalent to 0,05 % relative humidity or less. The sensor may take a number of forms: an electrical resistance element, an electrolytic cell, or an infra-red detector.

4.2.6 Means to convert the output from the sensor into a signal that can be used to calculate the amount of moisture passing through the test piece being tested in unit time.

4.2.7 Means of maintaining the test chamber and the sweep gas and the sensor at the required temperature.

NOTE 2 The normal test temperature is either $23^\circ\text{C} \pm 1^\circ\text{C}$ or $38^\circ\text{C} \pm 1^\circ\text{C}$, but other temperatures may be used.

4.2.8 Specimen of stated water vapour transmission rate supplied by the instrument manufacturer for standardization of the test cell.

¹⁾ The EPS digital WVTR meter and the Permatron W-series are examples of suitable instruments available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these instruments.