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**Paper and board — Determination of  
air permeance (medium range) —**

**Part 4:  
Sheffield method**

*Papier et carton — Détermination de la perméance à l'air (valeur  
moyenne) —*

*Partie 4: Méthode Sheffield*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

This third edition cancels and replaces the second edition (ISO 5636-4:2005), which has been technically revised. In this third edition mainly editorial changes have been made and also precision data has been added as informative [Annex C](#).

ISO 5636 consists of the following parts, under the general title *Paper and board — Determination of air permeance (medium range)*:

- *Part 3: Bendtsen method*
- *Part 4: Sheffield method*
- *Part 5: Gurley method*
- *Part 6: Oken method*

NOTE 1 *Part 1: General method* will be withdrawn after the third editions of Parts 3, 4 and 5 have been published, as it was considered redundant.

NOTE 2 *Part 2: Schopper method* was withdrawn in 2006 as it was considered obsolete.

NOTE 3 *Part 6: Oken method* is being prepared.

# Paper and board — Determination of air permeance (medium range) —

## Part 4: Sheffield method

### 1 Scope

This part of ISO 5636 specifies the Sheffield method for determining the air permeance of paper and board using the Sheffield apparatus.

It is applicable to papers and boards which have air permeances between 0,02  $\mu\text{m}/(\text{Pa}\cdot\text{s})$  and 25  $\mu\text{m}/(\text{Pa}\cdot\text{s})$  when tested with the Sheffield apparatus.

It is unsuitable for rough-surfaced materials, which cannot be securely clamped to avoid leakage.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

[ISO 5636-4:2013](https://standards.iteh.ai/catalog/standards/iso/9b3cf249-8612-4f72-91f3-830a2e317468/iso-5636-4-2013)

### 3 Terms and definitions

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

#### 3.1

##### air permeance

mean air flow rate through unit area under unit pressure difference in unit time, under specified conditions

Note 1 to entry: Air permeance 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 2 to entry: This property is called air permeance, and not air permeability, because it is reported as a sheet property and is not standardized with respect to thickness to give a material property per unit thickness.

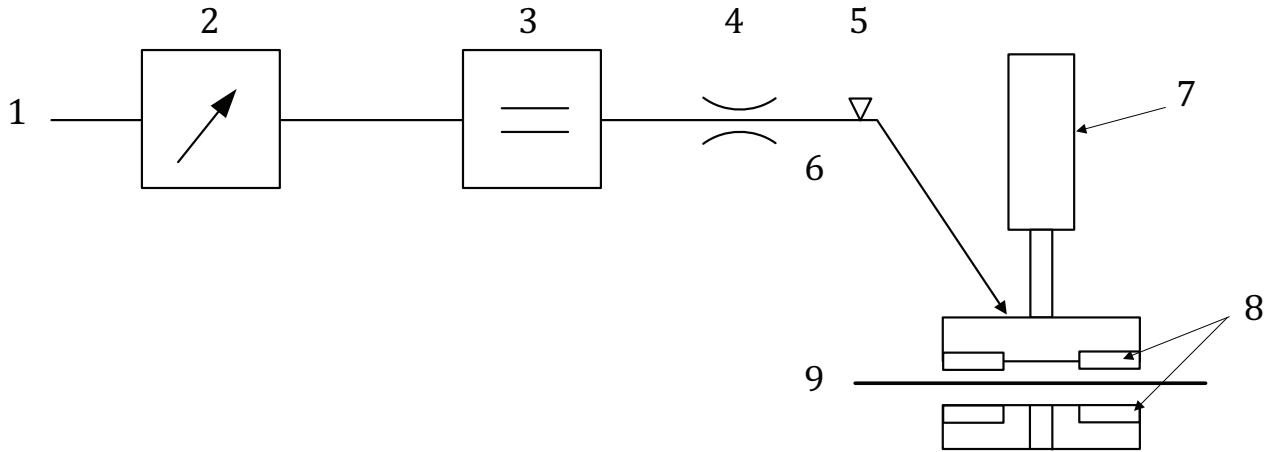
Note 3 to entry: The Sheffield unit is not defined, since it has been shown that the scale units (Sheffield units) on different types of Sheffield instruments can correspond to different air flows, and there is no precise physical definition. This part of ISO 5636 requires that the flowmeters be calibrated to give a flow rate in millilitres per minute.

### 4 Principle

A test piece is clamped between two rubber orifice plates of known dimensions. The absolute air pressure on one side of the test piece is equivalent to atmospheric pressure and the difference in pressure between the two sides of the piece is maintained at a small, substantially constant, value. The air flow rate through the test area is determined and the air permeance is calculated.

## 5 Apparatus

The Sheffield apparatus, see [Figure 1](#) for an example of one type of instrument, shall consist of an air supply (see [5.1](#)), an air-pressure regulating device (see [5.2](#)), a pressure manometer (see [5.3](#)), an air-flow-measuring device (see [5.4](#)) and a test assembly (see [5.5](#)) which houses a measuring head in which the test piece can be securely clamped.



### Key

- 1 air supply
- 2 pressure regulator
- 3 air-flow-measuring device
- 4 flow impedance
- 5 shut-off valve
- 6 measurement air
- 7 clamping air pressure
- 8 orifice plates
- 9 test piece

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**Figure 1 — Principles of operation of one type of apparatus**

**5.1 Air supply**, free from water, oil and other contaminants, at a pressure of 420 kPa to 950 kPa. A small compressor using laboratory air is preferred to external compressed air.

**5.2 Air-pressure regulating device**, to reduce the pressure to the nominal pressure at the measuring head of 10,3 kPa (variable-area flow-measuring devices, see [5.4.1](#)) or 9,85 kPa (electronic flow-measuring devices, see [5.4.2](#)).

**5.3 Pressure manometer**, with a suitable range to enable the air pressure at the measuring head to be set to the specified pressure within 2 % of the nominal value.

**5.4 Air-flow-measuring device**, of either a variable-area ([5.4.1](#)) or an electronic type ([5.4.2](#)), for measuring the air flow rate to the measuring head. The air flow rate shall be measurable to an accuracy of  $\pm 5\%$  of the measured value.

**5.4.1 Variable-area flow-measuring device**, consisting of three variable-area flowmeters each having a tapered glass column containing a metering float suspended by the air flow in the column. The three columns shall be chosen with dimensions such that they enable measurements to be made on a continuous scale of flow rate from 10 ml/min to 3 000 ml/min, with some overlap of scales between columns. Each