

Australian/New Zealand Standard™

Methods of test for pulp and paper

Method 447: Determination of air permeance (medium range)—Sheffield method



AS/NZS 1301.447:2016

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee PK-019, Methods of Test for Pulp and Paper, to supersede AS/NZS 1301.447s:1998, *Methods of test for pulp and paper*, Method 447s: *Sheffield air permeance of paper and board* (reconfirmed 2013).

The objective of this Standard is to provide a method for determining the air permeance of paper and board by means of the Sheffield air permeance instrument.

This Standard is identical with, and has been reproduced from ISO 5636-4:2013, *Paper and board—Determination of air permeance (medium range)*, Part 4: *Sheffield method*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text ‘this part of ISO 5636’ should read ‘this Australian/New Zealand Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO		AS/NZS	
186	Paper and board—Sampling to determine average quality	1301	Method of test for pulp and paper
		1301.417s	Method 417s: Sampling to determine average quality

The normative reference ISO 187 has not been adopted as an Australian/New Zealand Standard.

In Australia and New Zealand the following Standards are generally used:

AS/NZS 1301.414s:2006, *Methods of test for pulp and paper*, Methods 414s: *Conditioning of paper for testing*.

AS/NZS 1301.415s:2008, *Methods of test for pulp and paper*, Methods 415s: *Standard atmosphere for testing paper and board and procedure for monitoring the atmosphere*.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

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AUSTRALIAN/NEW ZEALAND STANDARD

Methods of test for pulp and paper

Method 447:

Determination of air permeance (medium range)—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*

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.

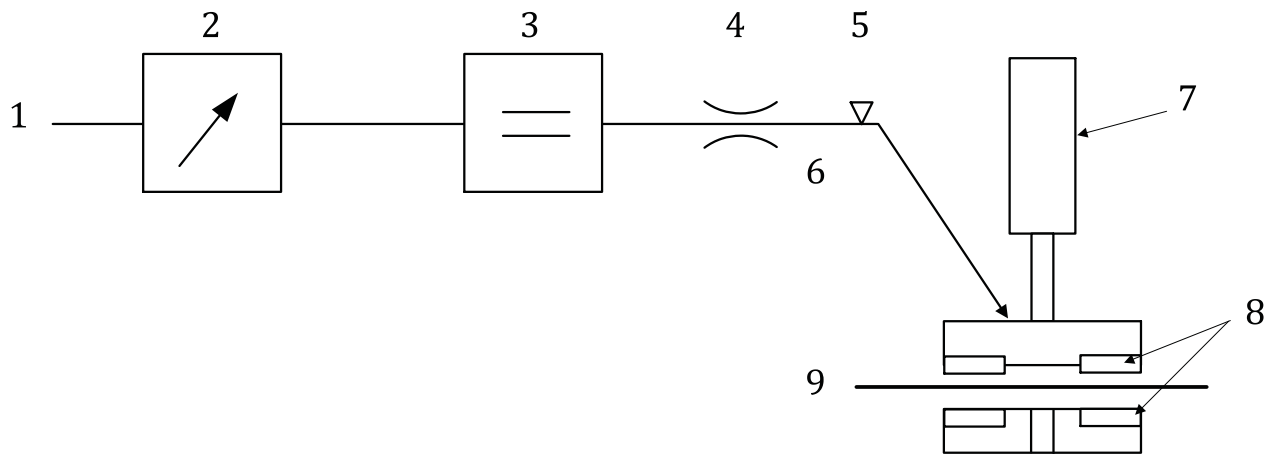
Note 3 to entry: The Sheffield unit is not defined, since it has been shown that the scale units (Sheffield units) on different types of Sheffield instruments can correspond to different air flows, and there is no precise physical definition. This part of ISO 5636 requires that the flowmeters be calibrated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

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 ± 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