**AUSTRALIAN STANDARD**
*Prepared by the Appita Testing Committee. Endorsed as Part of AS 1301 by Standards Australia — October 1989. Endorsed as suitable for use in New Zealand by the Standards Council of New Zealand.*

**AS 1301.420s—89**
Tentative Standard— November 1957
Standard —January 1962
Revised —July 1973
Revised— October 1989

# GURLEY AIR PERMEANCE OF PAPER

Gurley air permeance of paper is a measure of the air flow through a sheet of paper per unit area per unit pressure difference when measured by the measurement system used in Gurley instruments. It is expressed in μm/(Pa.s) and is calculated from the time taken for 100 mL of air (Note 5.1) to pass a circular area of 6.42 $cm^2$ of the sample under the conditions set out in this Standard Method.

A Gurley densometer as described in Section 1.1 or a Gurley-Hill SPS tester (Note 5.2) is used for the determination of the air permeance. The method is applicable to papers and paperboards which permit the passage of 100 mL of air in 2 to 1800s, excepting those which cannot be clamped securely against surface and edge leakage, such as crepe and corrugated papers.

Appendices for the care, maintenance and verification of instruments are included.

## 1. APPARATUS

**1.1 Air resistance tester** consisting of an outer cylinder partly filled with oil, and an inner cylinder which slides freely in the outer cylinder (Figure 1). The instrument may be either top clamping in which the test piece is clamped at the top of the cylinder, or bottom clamping in which the test piece is clamped at the top of the cylinder, or bottom clamping in which the test piece is clamped at the bottom of the cylinder. It is designed so that the floating inner cylinder applies a known air pressure to the test piece enabling the passage of a known volume of air to be timed (Note 5.2).

The clamping plates of the top clamping instrument are secured by knurled nuts. The clamping plates in the bottom clamping instrument are secured by a loading lever or a screw and capstan device. The clamping plates each have circular orifices which are concentric in the closed position. An elastic gasket is held, by adhesive if necessary, in a groove in the inner clamping plate (i.e. the one on the air pressure side) so that during a test the test piece is held between the gasket and the outer clamping plate. The purpose of the gasket is to prevent leakage of air across the inner surface of the test piece.

The diameter of the orifice in the outer clamping plate is 28.6 ±0.1 mm. The internal diameter of the gasket after it is fixed in the groove is 28.6 ±0.1 mm. The gasket is made from a sheet of oil-resistant, non-oxidizable elastic material having a smooth surface and of a hardness which reasonably ensures that in the clamped position the inside diameter remains within the limits specified, so that a test area of 6.42 +0.05 $cm^2$ can be assumed (Note 5.3). The inside diameter of the groove into which the gasket is fitted may vary from 28.4 to 28.7 mm depending on when the instrument was manufactured so that on some instruments the gasket must be stretched slightly to fit. The gasket shall protrude sufficiently beyond the surface of the clamping plate to provide an adequate seal but the protrusion shall be not more than 0.6 mm. The outside diameter of the gasket is about 35 mm, to fit the groove.

The inner cylinder is graduated up to 350 or 400 mL, these volumes representing cylinder volumes not actual volumes of air displaced during a test (Note 5.1). The inner cylinder has an internal diameter of 74.1 ±0.2 mm, a wall thickness of 1.1 ±0.1 mm, a height of about 254 mm and a mass of 567 ±1 g. The internal diameter and the mass are critical because they determine the air pressure during a test; the above dimensions will ensure that the system has a mass/area ratio within 1% of 0.1315 g/$mm^2$. The wall thickness is critical because it affects the displacement error (Note 5.1).

The dimensions of the outer cylinder are not critical provided that there is no interference with the oil flow or movement of the inner cylinder. The inside diameter is about 83 mm, the height is 254 mm and it is fitted with vertical guide bars to guide the movement of the inner cylinder.

The instrument is filled with oil to a depth of approximately 125 mm as indicated by a mark on the inner surface of the outer cylinder. The oil (Note 5.4) has a kinematic viscosity not greater than 13 $mm^2/s$ at 38°C and a flash point of not less than 135°C.

**1.2 Stopwatch** or other timing device including digital and automatic devices capable of recording elapsed time to within ±0.2 s.

ISBN 0 7262 5773 7 UDC 676.017