

Australian Standard™

Methods for testing flexible cellular polyurethane

Method 14: Determination of air flow

PREFACE

This Standard was prepared by the Standards Australia Committee PL/36, Flexible Polyurethane, to supersede AS 2282.14 — 1991.

During the preparation of this revision cognizance was taken of ISO 7231:1984, *Polymeric materials, cellular flexible — Method of assessment of air flow value at constant pressure drop*.

METHOD

1 SCOPE This Standard sets out a method for the measurement of the ease with which air passes through a cellular structure. Air flow values may be used as an indirect measurement of certain cell structure characteristics.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

2282 Methods for testing flexible cellular polyurethane

2282.1 Method 1: Sampling and conditioning of test specimens

2282.2 Method 2: Measurement of dimensions of test specimens

3 DEFINITIONS For the purpose of this Standard, the definitions below apply.

3.1 Air flow value — the volume of air per second, at standard temperature and pressure, required to maintain a constant pressure differential of 125 Pa across a flexible cellular test piece of dimensions approximately 50 mm × 50 mm × 25 mm.

3.2 Air flow parallel to cell rise — air flow value obtained when the air enters and leaves the mounted test piece parallel to the direction of cell rise.

3.3 Air flow perpendicular to cell rise — air flow value obtained when the air enters and leaves the mounted test piece perpendicular to the direction of cell rise.

4 PRINCIPLE A flexible cellular test piece is placed in a cavity over a vacuum chamber and a specified constant air pressure differential is created. The rate of air flow required to maintain this pressure differential is the air flow value.

5 APPARATUS A suitable apparatus is shown in Figure 1. The following parts are required:

- (a) *Vacuum chamber* A pot of nominal dimensions 130 mm internal diameter and 150 mm high, with provision for mounting the test piece and fittings for the manometer and air exhaust. The test piece mount cavity shall be 50.0 ± 0.05 mm $\times$ 50.0 ± 0.05 mm $\times$ 25.0 ± 0.05 mm in size. Four support vanes, approximately 1 mm thick and 12.5 mm high, shall be placed under the opening to prevent the test piece from being pulled into the test chamber. The vanes shall be spaced 12.5 mm on centre from each other, and also centred relative to the bottom of the cavity opening. The manometer fittings shall enter a 1 mm hole midway along the side of the chamber. A 25 mm pipe fitting shall be used as the exhaust outlet from the centre of the bottom of the chamber.

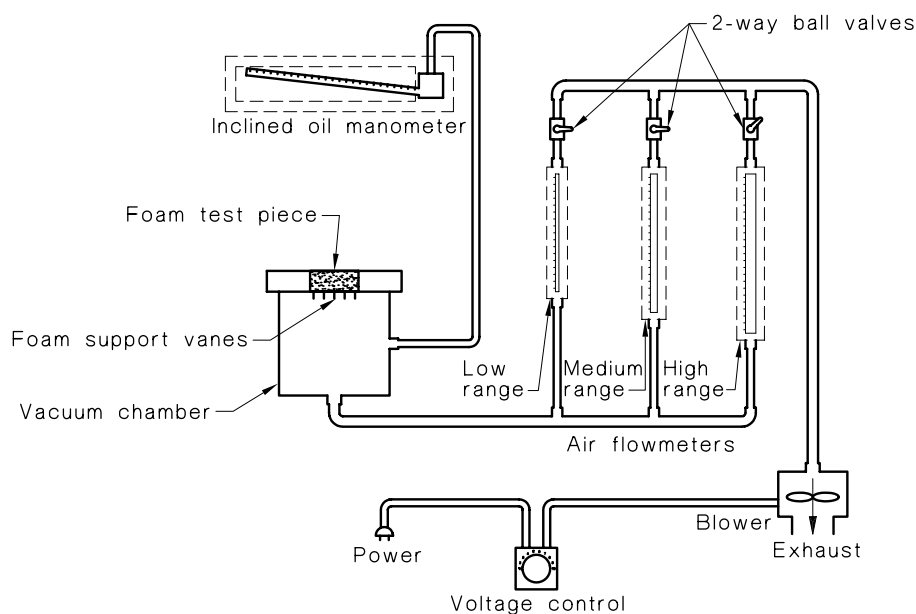


FIGURE 1 TYPICAL AIR FLOW APPARATUS

- (b) *Manometer* A manometer calibrated from 0 to 250 Pa, accurate to ± 2 percent, is required.

An inclined oil manometer with graduations of 2 Pa is recommended.

A level mounted on the oil manometer should be used to maintain the calibration factor. A trap should be provided on the liquid side of the manometer to guard against accidental excess vacuum. A plunger in the fluid reservoir should be used to set the zero point of the 'level' manometer. Zero setting readings should be taken only after the indicating fluid has had a minimum equilibrium time of 2 min. Longer times may be required if the indicating fluid has been splashed into the trap.

- (c) *Flowmeters and blower* Low pressure drop air flowmeters accurate to ± 2 percent are suitable for air flow measurements. Air flowmeters with a full scale of at least 260 mm are recommended. Since the flowmeter calibration is temperature and pressure dependent, the use of the apparatus under ambient conditions can result in erroneous readings.

NOTE: Flowmeters with a range from 0 to 10 litres per second (L/s) will cover a wide range of cellular plastics, but those with a lesser range may be used.

Actual flow is adjusted by a combination of valve restriction and blower speed. The two-way valves should be mounted on the output side of the flowmeter to maintain the pressure drop across the flowmeter constant at any given flow level. A vacuum cleaner type unit may be used for an exhaust blower.

6 SAMPLE PREPARATION

6.1 Test pieces

6.1.1 Dimensions of test pieces The test pieces shall be right parallelepipeds cut to fit the mount cavity of the apparatus. A cavity 50 mm $\times$ 50 mm requires a test piece with dimensions 51.0 $\pm$ 0.3 mm $\times$ 51.0 $\pm$ 0.3 mm $\times$ 25.0 $\pm$ 0.5 mm.

6.1.2 Number of test pieces Three test pieces shall be cut from the sample taken from each location and orientation to be tested.

6.1.3 Preparation of test pieces A bandsaw with a movable table and a double bevel knife edge blade is recommended for cutting the test pieces.

6.2 Test conditions The testing should be carried out at standard conditions of 23 $\pm$ 2°C and 50 $\pm$ 5% relative humidity.

6.3 Conditioning Test specimens shall be conditioned in accordance with AS 2282.1.

7 PROCEDURE

7.1 Leak test The apparatus (see Figure 1) shall be checked for leaks in the following manner:

- (a) Seal the test piece mounting cavity with masking tape.
- (b) With all the flowmeter valves closed, turn the air supply to approximately one third of the maximum setting and observe any movement of the manometer liquid. The manometer reading, if any, shall not exceed 1 Pa after 30 s.
- (c) Open the valve on the lowest range flowmeter very slightly. The flow should be essentially zero, as shown by a movement of less than 3 mm of the flowmeter float from its static position.

For the equipment to perform satisfactorily over its entire range, the requirements for both parts of the leak test should be met.

7.2 Measurement of test pieces Each test piece shall be measured in accordance with AS 2282.2.

7.3 Air flow test procedure The test procedure is as follows:

- (a) Place the test piece in the test cavity with any skin on the side exposed to low pressure. Make sure that the test piece is free from undue strain, and that a good air seal is obtained along the edges of the test piece and the apparatus. The top of the test piece should be flush with the top of the test chamber.
- (b) Close the flowmeter valves and switch on the exhaust blower or vacuum pump. Adjust the voltage control to 30 percent of full value.