International Standard 7231

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Polymeric materials, cellular flexible — Method of assessment of air flow value at constant pressure-drop

Matériaux polymères alvéolaires souples — Détermination de l'indice d'écoulement d'air — Méthode à chute de pression constante

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Polymeric materials, cellular flexible — Method of assessment of air flow value at constant pressure-drop

1 Scope and field of application

This International Standard specifies a method for determining the air flow value of cellular polymeric flexible materials. Air flow values may be used to give an indication of the effects of formulation and production variables on the cellular structure.

2 Definition

air flow value: The volume flow rate required to maintain a constant pressure differential across a flexible foam test piece.

For the purposes of this International Standard the units of air flow value are cubic decimetres per second.

3 Principle

A specified constant air pressure differential is created across a standard flexible foam specimen. The rate of flow of air required to maintain this pressure differential is the air flow value.

4 Apparatus

Diagrams of suitable apparatus are shown in figures 1 and 2. The essential parts are:

4.1 Flowmeters

Low pressure drop flowmeters accurate to ± 2 % for air flow measurements are required. Actual air flow shall be adjusted by a combination of valve restriction and blower speed. Two-way valves shall be mounted as shown in figures 1 and 2, such that the pressure drop across the flowmeter is constant at any given flow rate.

NOTE — Air flowmeters with at least 250 mm scales are recommended. Flowmeters in the range 0 to 10 dm^3/s will cover a wide variety of cellular polymeric materials.

4.2 Manometer

A manometer calibrated in the 0 to 250 Pa range with an accuracy of ± 2 % is required.

Traps to prevent manometer liquid being drawn into the chamber by accidental excess pressure changes shall be provided. A plunger in the fluid reservoir is used to set the zero point after levelling the manometer.

NOTE — The use of an inclined manometer with 2 Pa graduation is recommended. A level mounted on the manometer should be used to ensure that the proper degree of inclination from the horizontal is maintained.

4.3 Blowers

The air supply may be such that positive or negative pressure differences from atmospheric pressure are obtained across the test piece, using compressed air, exhaust blower or vacuum pumps etc.

NOTE — A particular apparatus may be constructed to use only positive or negative pressure.

4.4 Test piece mounting

A chamber of nominal dimensions 140 mm diameter × 150 mm depth (see figure 1) or 75 mm diameter × 1 000 mm length (see figure 2) incorporating a test piece mounting and fittings for the manometer and exhaust shall be provided. The test piece cavity shall be 50 ± 0,05 mm × 50 ± 0,05 mm × 25 ± 0,05 mm.

The test piece shall be supported by suitable means, for example by the use of vanes, wires or a perforated support. The support should provide a minimum open proportion of 70 % of the overall area evenly distributed over its area (see figures 1 and 2 for the positioning supports). Manometer and exhaust fittings shall be as shown in figures 1 and 2.

4.5 Test chamber operating at below atmospheric pressure

4.5.1 Leak test

The apparatus (see figure 1) shall be checked for leaks in the following manner:

4.5.1.1 Seal the test piece mounting cavity with masking tape.

4.5.1.2 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. The manometer reading shall not exceed 1 Pa after 30 s.

4.5.1.3 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.

5 Test pieces

The test piece shall be in the form of a right parallelepiped of dimensions 51,0 ± 0,3 mm × 51,0 ± 0,3 mm × 25,0 ± 0,3 mm. The test piece shall be cut without deformation of the original cell structure. Three test pieces shall be tested.

NOTE — Test pieces both with and without surface skin may be tested by this method but the results will not be comparable.

6 Test conditions

Testing shall be carried out under the standard conditions of either 23 ± 2 °C and 50 ± 5 % relative humidity or 27 ± 2 °C and a relative humidity of 65 ± 5 %.

NOTE — Since the flowmeter calibration is sensitive to temperature, results may not be comparable between these two sets of conditions.

7 Procedure

7.1 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.

7.2 Close the flowmeter valves and switch on the exhaust blower or vacuum pump.

7.3 Open the high-range flowmeter slowly and adjust the air flow to obtain a pressure differential of 125 ± 1 Pa on the manometer.

7.4 If this reading is less than 10 % of full scale, close this flowmeter valve and open the medium range flowmeter valve. Repeat this procedure until the correct flowmeter has been selected and the reading obtained.

NOTE — For greater accuracy it may be preferable to use two adjacent flowmeters, holding the higher range one steady on an appropriate graduation mark and making the adjustment on the lower range flowmeter. In this case, the air flow value is obtained from the sum of the two flowmeter readings after maintaining the pressure differential for 10 s.

7.5 Record the reading obtained as described in 7.4 as the air flow value of the specimen in cubic decimetres per second.

8 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) a description and the identity of the material;

c) the thickness of the test pieces if other than as specified in clause 5;

d) the orientation of the test piece with respect to the direction of any anisotropy, and the presence or absence of any skins;

e) the conditions used, i.e. temperature, relative humidity, apparatus type, and pressure direction;

f) the individual test results and mean air flow value, expressed in cubic decimetres per second to the nearest 0,1 dm^3/s.

Dimension in millimetres

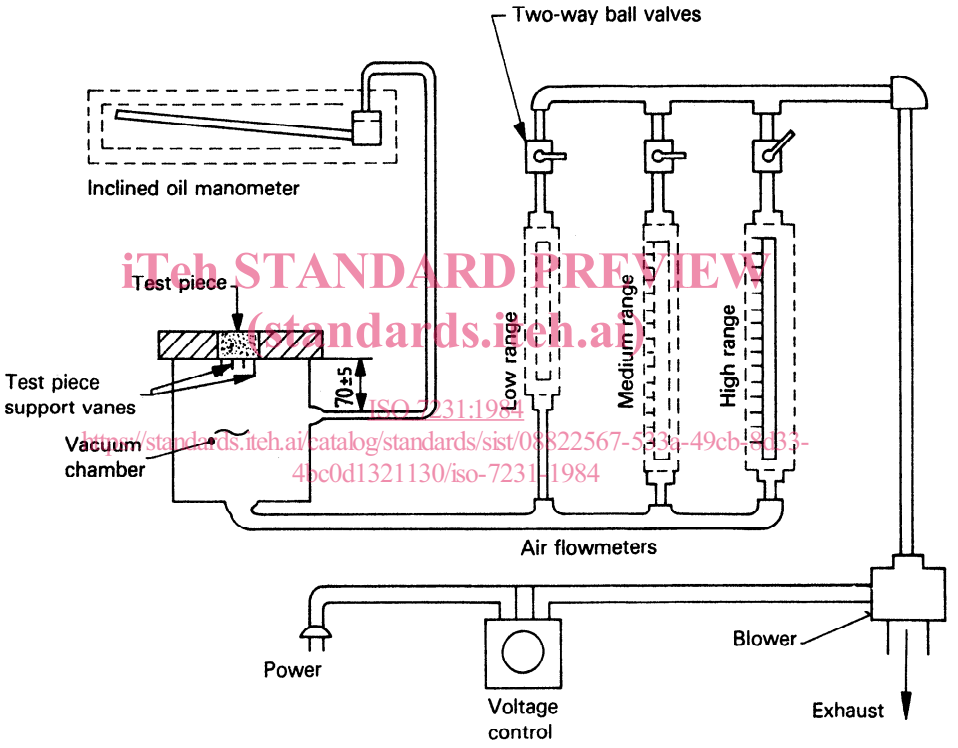

Figure 1 — Air flow apparatus: schematic diagram (using air pressure below atmospheric)

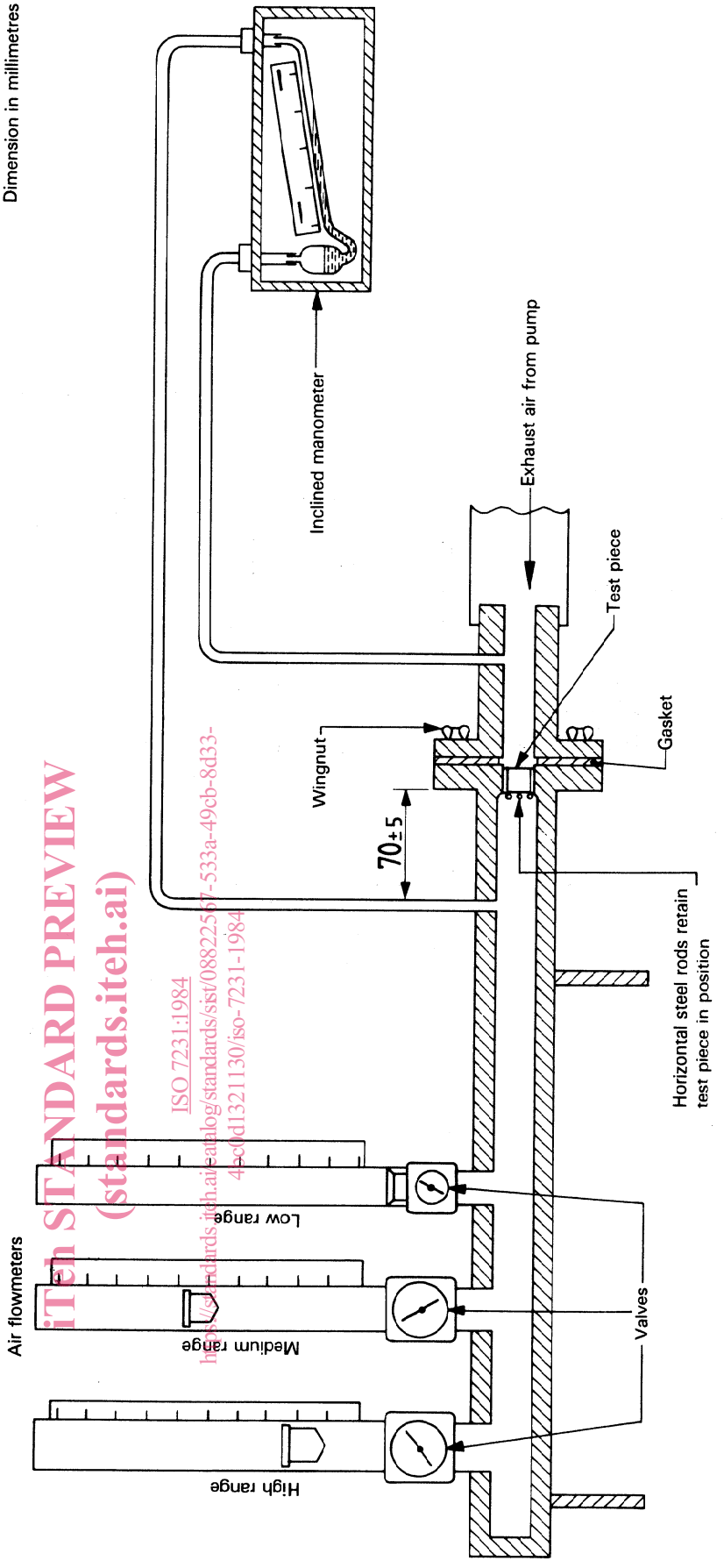

Figure 2 — Air flow apparatus : schematic diagram (using air pressure above atmospheric)

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