BRITISH STANDARD

BS 3424 :
Part 16 :
1995

# Testing coated fabrics

## Part 16. Method 18. Determination of air permeability

IMPORTANT NOTE. It is recommended that this Part be read in conjunction with the information in Part 0. *Foreword and general introduction.*



STANDARDS

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/78, Coated fabrics, upon which the following bodies were represented:

British Apparel and Textile Confederation
British Plastics Federation
British Railways Board
British Rubber Manufacturers' Association Ltd.
British Textile Technology Group
Department of Health
Department of the Environment (Building Research Establishment)
Furniture Industry Research Associaton
Home Office
Industrial Safety (Protective Equipment) Manufacturers' Association
Made-Up Textiles Association
RAPRA Technology Ltd.
SATRA Footwear Technology Centre
Society of Motor Manufacturers and Traders Limited

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Ministry of Defence

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on 15 December 1995



The following BSI references relate to the work on this standard:
Committee reference PRI/78
Draft for comment 94/342269 DC

ISBN 0 580 24507 1

**Amendments issued since publication**

| Amd. No. | Date | Text affected |
|---|---|---|
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# Contents

# Foreword

This British Standard has been prepared by Technical Committee PRI/78, Coated fabrics.

Air permeability is an important factor in the performance of products such as filters, clothing, tentage, sails, parachutes, building structures and acoustical suppressers.

The level of permeability may be required to be relatively high for some applications or extremely low for others. For some applications such as gaskets, protective equipment and airbags, the coated fabric may need to be resistant to the passage of gases even at the molecular level. In these latter instances, the methods of test in BS 903 : Part A30 or BS 2782 : Method 821 A are more appropriate.

**Compliance with a British Standard does not itself confer immunity from legal obligations.**

## 1 Scope

This Part of BS 3424 describes a method for determining the air permeability of coated fabrics. It is suitable for measuring the air permeability of perforated coated fabrics used for filters, coverings and acoustical absorbers such as car headlining where the air permeability is not less than 8 mm/s at 98 Pa.

## 2 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by updating or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

## 3 Principle

The rate of air flow through a known area of coated fabric is adjusted so that there is a known pressure drop across the fabric.

## 4 Apparatus

**4.1** *A rigidly mounted circular specimen holder*, having an orifice 5 $cm^2$, 20 $cm^2$, 50 $cm^2$ or 100 $cm^2$, (i.e 25.23 mm ± 0.05 mm, 50.05 mm ± 0.05 mm, 79.79 mm ± 0.05 mm or 112.84 mm ± 0.05 mm diameter).

**4.2** *Means for clamping the test specimen*, securely and without distortion in the circular specimen holder and means for preventing leakage of air from the edges of the test specimen.

NOTE. Leakages may be measured separately and taken into account in calculating results.

**4.3** *A calibrated pressure gauge or manometer*, accurate to within ±2 % of the recorded or indicated pressure.

**4.4** *A suction pump*, capable of drawing a steady flow of air through the test specimen. Means shall be provided for adjusting the suction rate so that the pressure differential across the test specimen is maintained at a constant of 50 Pa, 100 Pa, 200 Pa, 500 Pa or 1 kPa.

**4.5** *Calibrated flow meters or volumetric counters*, to indicate the velocity and volume of air passing through the test specimen.

NOTE 1. Measurement on the inlet and outlet sides of the test specimen are advisable.

NOTE 2. Illustrations of suitable arrangements are given in informative annex A.

## 5 Selection of test specimens

Select seven test specimens, each of a size appropriate to the apparatus being used.

NOTE. This usually requires a test specimen to be not less than 25 mm greater in diameter than the orifice of the specimen holder (see **4.1**). If the coefficient of variation of individual observations on similar materials is known, the number of tests conducted may be varied according to the relationship.

$$n = 0.154 \times V^2$$

where

$n$ is the number of tests conducted;

$V$ is the coefficient of variation of test results.

## 6 Preparation of test specimens

Pre-condition and condition each test specimen in accordance with Part 2 of BS 3424, ensuring that each test piece is kept flat, unfolded and undisturbed, for not less than 3 h.

## 7 Atmosphere

Ensure that the temperature, relative humidity and barometric pressure of the air surrounding the test apparatus and being drawn into the test circuit is maintained to within ±5% of the required conditions between the beginning and end of the test. Unless otherwise specified these conditions should be those specified in BS 3424 : Part 2.

## 8 Procedure

NOTE. Advice on checking and calibrating the apparatus is given in annex A.

Mount the test specimen in the circular specimen holder (**4.1**), (coated surface to low pressure side if single faced) with sufficient tension to eliminate wrinkles or creases but without distorting the fabric construction or coating. Avoid selvedges. Start the suction pump (**4.4**) and adjust the rate of flow until the required pressure differential (see **4.4**) is obtained. Record the air flow rate in litres per minute (see **4.5**). Maintain the pressure differential for a further 1 min and again record the air flow rate in litres per minute.

NOTE. For apparel fabrics a pressure drop of not less than 200 Pa is recommended but for most coated fabric applications the pressure differential will need to be at least 500 Pa.

## 9 Calculation and expression of results

### 9.1 Mean air flow rate and CV %

Calculate the arithmetic mean of the air flow rates recorded in clause **8** and determine the coefficient of variation to the nearest 0.1 % at the 95 % confidence level using BS 5324 or BS 2846 : Part 1.

### 9.2 Air permeability

Calculate the air permeability ($R$) in mm/s as follows:

$$R = \frac{r}{A} \times 167$$

where

$r$ is arithmetic mean of the air flow rate in L/min determined at **9.1**;

$A$ area of orifice of test assembly (see **4.1**) in $cm^2$.

Report the results to the nearest 2 % of $R$.

NOTE. No recent interlaboratory tests have been conducted using this method. Statements in ASTM D 737 would suggest that the variance for air permeability of coated fabrics expressed as a coefficient of variation, when the test is conducted in a single laboratory by the same operator, is typically between 3 % to 6 % and that if results differ by more than a factor of 4.7 as a critical difference using 7 test results or by a factor of 3.31 using 14 test results, the difference is statistically significant at the 95 % probability level.

## 10 Test report

The test report shall include the following particulars:

a) the description of the coated fabric tested and reference to this method of test;

b) the mean air permeability;

c) the number of test specimens tested;

d) if the coated fabric is a single faced fabric, which side of the coated fabric was exposed to the incoming air;

e) confirmation of the air temperature, relative humidity and barometric pressure throughout the test;

f) the pressure differential applied across the test specimen;

g) any deviations from the standard test procedure.

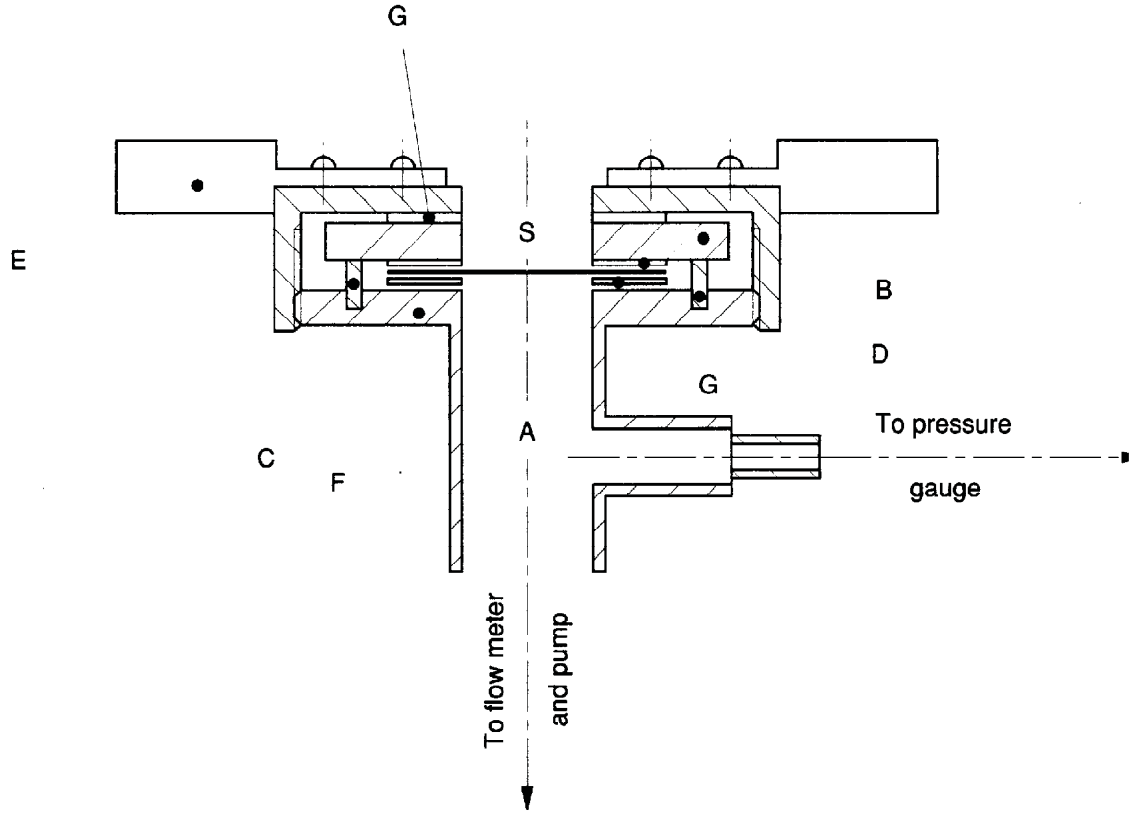
# Annex

## Annex A (informative)

## Suitable test apparatus

### A.1 Advice on checking and calibrating the apparatus

It is advisable to verify the calibration and proper functioning of the apparatus weekly, if in daily use, and prior to testing if used infrequently, and after the instrument has been moved or repaired. The calibration of the instrument should be checked periodically against a primary reference standard and at intervals of not greater than 12 months. The accuracy of the pressure gauge, temperature recording devices, flow meters and psychrometers should be verified periodically and at intervals not greater than 12 months.




Key

| | |
|---|---|
| A | is a circular orifice (see **4.1**) |
| B | is an annular clamping disc having the same orifice dimensions as 'A' |
| C | locating pins of 'B' |
| D | locating holes for C in flange |
| E | screw top clamp threaded with flange F |
| F | externally threaded metal flange having orifice A and locating holes D |
| G | rubber sealing gaskets having a hardness of 60 to 70 IRHD approximately 2.5 mm thick |
| S | test specimen |

**Figure A.1 Illustration of suitable test apparatus**

# List of references (see clause 2)

## Normative references

### BSI publications

| | |
|---|---|
| BS 903 | *Physical testing of rubber* |
| Part A30 : 1975 | *Determination of the permeability of rubber to gases (constant pressure method)* |
| BS 2782 | *Methods of testing plastics* |
| Part 8 | *Other properties* |
| Method 821 A : 1979 | *Determination of the gas transmission lates of films and thin sheets under atmospheric pressure (manometric method)* |
| BS 2846 | *Guide to statistical interpretation of data* |
| Part 1 : 1991 | *Routine analysis of quantitative data* |
| BS 5324 : 1976 | *Guide to application of statistics to rubber testing* |

### Other publications

| | |
|---|---|
| ASTM D.737-75 | *Standard test method for iar permeability of textile fabrics*[1)] |

[1)] published by the American Society for Testing and Materials — ASTM 1916 Race St Philadelphia, PA 19103 — USA.

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9512—5—0.35k—FP

ISBN 0 580 24507 1 Product code 00552430 PRI/22