

Determination of the thermal resistance of textiles — Two-plate method: fixed pressure procedure, two-plate method: fixed opening procedure, and single-plate method

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee TCI/24, Physical testing of textiles, upon which the following bodies were represented:

- Association of Consulting Scientists
- Association of Suppliers to the British Clothing Industry
- British Apparel and Textile Confederation
- British Measurement and Testing Association
- British Textile Machinery Association
- British Textile Technology Group
- Defence Procurement Agency
- Furniture Industry Research Association
- National Wool Textile Export Corporation
- S A T R A Technology Centre
- Society of Dyers and Colourists
- Textile Institute
- UK Textile Laboratories Forum
- Woolmark Company
- Co-opted members

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Foreword

This British Standard has been prepared by Technical Committee TCI/24. It supersedes BS 4745:1990, which has been withdrawn.

The method has been derived from ISO 5085-1:1989, *Textile determination of thermal resistance of textiles — Part 1: Low thermal resistance*, and has been modified by TCI/24.

Three methods for the determination of thermal resistance are described, as referred to in the scope. The method used must be agreed between interested parties because the results from the different methods are not necessarily comparable.

Related standards are:

- ISO 5085-2, *Textiles — Determination of thermal resistance of textiles — Part 2: High thermal resistance*.
- BS 874-1, BS 874-3.1, BS 874-3.2: Methods for determining thermal insulation properties.

This new edition of BS 4745 incorporates technical changes only. It does not reflect a full review or revision of the standard, which will be undertaken in due course.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 9 and a back cover.

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1 Scope

This part of BS 4745 specifies three methods for the determination of the resistance of fabrics, fabric assemblies or fibre aggregates in sheet form to the transmission of heat through them in the steady state condition. It applies to materials whose thermal resistance is up to approximately $0.2 \text{ m}^2 \cdot \text{K/W}$.

These methods are suitable for materials up to 20 mm thick (above this thickness, edge losses become appreciable). Advice on suitable components for constructing the apparatus is given in Annex A and means of calculating the thermal conductivity are described in Annex B.

Three methods are described:

- a) two-plate method: fixed pressure procedure;
- b) two-plate method: fixed opening procedure;
- c) single-plate method.

Either of the two-plate methods is suitable for materials that, when in use, have their outer faces shielded from the ambient air, e.g. a blanket when covered by a bedspread.

The single-plate method is suitable for materials that, when in use, have their outer faces exposed to the ambient air (e.g. bedspreads and outerwear).

The two-plate methods are generally preferred on accuracy and reproducibility grounds.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the reference cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN ISO 5084, *Textiles — Determination of thickness of textiles and textile products*.

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*.

ISO 8302, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Guarded hot plate apparatus*.

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1

thermal resistance

R

ratio of the temperature difference between the two faces of a test specimen to the rate of flow of heat per unit area normal to the faces. It is analogous to electrical resistance in the case of current flow through an electrical conductor

3.2

thermal conductivity

k

quantity of heat that passes in unit time through unit area of a slab of infinite extent and of unit thickness when unit difference of temperature exists between the faces of the slab

NOTE 1 $R = \frac{d}{k}$

where

d is the thickness of the slab.

NOTE 2 For a flat material having parallel faces, thermal conductivity is the reciprocal of thermal resistance per unit thickness.

NOTE 3 Since a textile is a heterogeneous system consisting of fibres and air, the term thermal conductivity does not have its usual precise meaning since, in addition to conduction, heat can be transferred through a textile by radiation and possibly by convection. The heat transfer rate incorporated in the definition is therefore the overall transfer by conduction and by radiation (and by convection where applicable).