BRITISH STANDARD

BS 2471:2005

Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area

ICS 59.080.30

BSI British Standards

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

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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Contents

Foreword

This British Standard has been prepared by Technical Committee TCI/24. It supersedes BS 2471:1978, which is withdrawn.

The original version of this British Standard was identical to ISO 3801:1977, which was prepared by ISO Technical Committee ISO/TC 38 with the active participation of the UK. BS 2471:1978 was partially replaced by BS EN 12127:1997, which will remain current on the publication of this revision of BS 2471. BS 2471 covers ISO 3801:1977, Clauses 1 to 4; the measurement of mass per unit area using small samples is covered by BS EN 12127 and is therefore no longer covered by BS 2471.

This is a full revision of the standard. The principal changes from the previous edition are as follows.

a) In Clause **3**, the different options available for the measurement of mass per unit length and mass per unit area of fabric pieces are laid out more clearly, and with an outline of each method, to enable the user of the standard to select the appropriate procedure for their particular fabric and circumstances.

b) The procedural sections have been ordered more logically to enable the user to carry out the procedure by following the steps in a chronological manner.

c) Some references to the "small sample" method of measuring mass per unit area have been removed.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

Summary of pages
This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 5 and a back cover.

Introduction

The mass per unit length and mass per unit area of a fabric can be determined in more than one way. For some fabrics, mass per unit length and mass per unit area are related simply by the width of the fabric, but for other fabrics variations in structure (whether in the selvedges or in the body of the fabric) can introduce an important distinction between mass per unit length and mass per unit area. It is important, therefore, to consider all the possible methods and to choose one that is appropriate to the fabric. A choice also needs to be made between test methods suitable for samples or specimens of cloth (i.e. short lengths or cuttings) and those suitable for application to fabric in bulk, i.e. in the piece (the normal unit of production). No method is so much more accurate than the others as to justify its being set up as the sole standard method. Specific circumstances should, therefore, govern choices between mass per unit length and mass per unit area and between a method applicable to samples and a method applicable to pieces.

1 Scope

This British Standard gives methods for the determination of:

a) mass per unit length; and

b) mass per unit area

of woven fabrics that have been in the standard atmosphere for testing.

The methods are applicable to woven fabrics (including those of the "stretch" type) made up full width or folded down the middle, and apply to the determination of the fabric mass of complete pieces as well as of sample lengths.

2 Normative references

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

BS EN 1773*, Fabrics — Determination of width and length.*

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

3 Principle

3.1 Method 1 — Measurement on short samples or cuttings that can be conditioned in the standard atmosphere for testing

After conditioning, the length and the mass of the fabric are determined and the mass per unit length calculated, or the length, width, and mass of the fabric are determined and the mass per unit area calculated, as required.

3.2 Method 2 — Measurement on bulk pieces that can be conditioned in the standard atmosphere for testing

After conditioning, the length and the mass of the whole piece of fabric are determined and the mass per unit length calculated, or the length, width, and mass of the fabric are determined and the mass per unit area calculated, as required.

3.3 Method 3 — Measurement on bulk pieces that cannot be conditioned in the standard atmosphere for testing

When it is impracticable to condition the whole piece in the standard atmosphere for testing, the length (and width) and the mass of the piece are determined after relaxation in the prevailing atmosphere, and a correction factor is applied to give the conditioned values. The conditioned mass per unit length (or mass per unit area) is then calculated. The correction factor is determined by comparison of the length (and width) and the mass of a specific portion cut from the piece after relaxation, measured firstly in the ambient atmosphere and then in the standard atmosphere for testing.

4 Apparatus

4.1 *Calibrated steel rule* of length not less than 2 m, graduated in centimetres and millimetres.

NOTE The rule should preferably be 3 m in length.

4.2 *Device* to enable a specimen of full width to be cut at right angles to the selvedge.

4.3 *Balance*, capable of determining the mass of pieces or sample lengths (as relevant) to an accuracy of ±0.2 % of the determined mass.

4.4 *Table*, having a smooth flat surface, a width greater than that of the woven fabric to be measured and a length of not less than 4 m.

5 Atmosphere for conditioning and testing

The atmosphere for conditioning and testing textiles shall be in accordance with BS EN ISO 139.

Pre-conditioning shall be carried out as described in BS EN ISO 139, unless it is known that the fabric, as received, can be conditioned from the "dry side".

Equilibrium with the pre-conditioning or conditioning atmosphere shall be deemed to have been reached when the difference between successive weighings, made at intervals of not less than 2 h, does not exceed 0.5 % of the final mass of the fabric when conditioned in this atmosphere.

6 Procedure

6.1 Selvedges

If the mass per unit length (or area) of the selvedge differs appreciably from the mass per unit length (or area) of the fabric, the mass per unit area shall be determined on a sample from which the selvedges have been removed along the outermost warp threads of the body, and calculation(s) shall be based on the mass of the trimmed sample and its length and width.

6.2 Method 1: Measurement on short samples or cuttings that can be conditioned in the standard atmosphere for testing

6.2.1 Ensure that the fabric is cut across the full width of the piece along parallel lines at right angles to the selvedge and that the length of the sample is not less than 0.5 m and preferably 3 m to 4 m.

6.2.2 Condition the sample or cutting in accordance with Clause **5**.

6.2.3 Determine the conditioned length of the sample in accordance with BS EN 1773.

6.2.4 If the mass per unit area is required, determine the conditioned width of the sample in accordance with BS EN 1773.

6.2.5 Determine the conditioned mass of the sample.

6.2.6 Calculate the mass per unit length in accordance with **7.2**, or mass per unit area in accordance with **7.3**, as required.

6.3 Method 2: Measurement on bulk pieces that can be conditioned in the standard atmosphere for testing

6.3.1 Condition the whole piece in accordance with Clause **5**.

6.3.2 Determine the conditioned length of the piece in accordance with BS EN 1773.

6.3.3 If the mass per unit area is required, determine the conditioned width of the piece in accordance with BS EN 1773.

6.3.4 Determine the conditioned mass of the whole piece.

6.3.5 Calculate the mass per unit length in accordance with **7.2**, or mass per unit area in accordance with **7.3**, as required.

6.4 Method 3: Measurement on bulk pieces that cannot be conditioned in the standard atmosphere for testing

6.4.1 Ensure that the whole piece is in the relaxed state in the ambient atmosphere.

6.4.2 Determine the length of the piece in the ambient atmosphere in accordance with BS EN 1773.

6.4.3 If the mass per unit area is required, determine the width of the piece in the ambient atmosphere in accordance with BS EN 1773.

6.4.4 From preferably the middle of the piece, cut a full-width sample of length not less than 1 m and preferably 3 m to 4 m.

6.4.5 Determine the length of the sample in the ambient atmosphere in accordance with BS EN 1773.

6.4.6 If the mass per unit area is required, determine the width of the sample in the ambient atmosphere in accordance with BS EN 1773.

6.4.7 Determine the mass of the whole piece, and also the mass of the sample at the same time, to minimize the effect of any sudden changes in the temperature or humidity of the ambient atmosphere.

6.4.8 Condition the sample in accordance with Clause **5**.

6.4.9 Determine the conditioned length and mass of the sample and, if the mass per unit area is required, its conditioned width.

6.4.10 Calculate the conditioned length, width (if mass per unit area required) and mass of the whole piece in accordance with **7.1**. Then calculate the mass per unit length in accordance with **7.2**, or mass per unit area in accordance with **7.3**, as required.

7 Calculation of results

7.1 Conditioned length, width (if mass per unit area is required) and mass (Method 3 only)

For Method 3 only, first calculate the conditioned length, width (if mass per unit area required) and mass of the piece using equations 1 to 3.

$$L_c = \frac{L_r \times L_{sc}}{L_{sr}} \quad (1)$$

where:

L_c is the conditioned length of the piece, in metres (m);

L_r is the relaxed length of the piece, in metres (m);

L_{sc} is the conditioned length of the sample, in metres (m);

L_{sr} is the relaxed length of the sample, in metres (m).

$$W_c = \frac{W_r \times W_{sc}}{W_{sr}} \quad (2)$$

where:

W_c is the conditioned width of the piece, in metres (m);

W_r is the relaxed width of the piece, in metres (m);

W_{sc} is the conditioned width of the sample, in metres (m);

W_{sr} is the relaxed width of the sample, in metres (m).

$$M_c = \frac{M_r \times M_{sc}}{M_{sr}} \quad (3)$$

where:

M_c is the conditioned mass of the piece, in grams (g);

M_r is the mass of the piece in the ambient atmosphere, in grams (g);

M_{sc} is the conditioned mass of the sample, in grams (g);

M_{sr} is the mass of the sample in the ambient atmosphere, in grams (g).

7.2 Mass per unit length

For all methods, calculate the mass per unit length (if required) using equation 4.

$$M_{ul} = \frac{M_c}{L_c} \quad (4)$$

where:

L_c is the conditioned length of the piece or sample, in metres (m);

M_c is the conditioned mass of the piece or sample (with or without selvedges as relevant), in grams (g);

M_{ul} is the mass per unit length, in grams per metre (g/m).

7.3 Mass per unit area

For all methods, calculate the mass per unit area (if required) using equation 5.

$$M_{ua} = \frac{M_c}{L_c \times W_c} \quad (5)$$

where:

L_c is the conditioned length of the piece or sample, in metres (m);

M_c is the conditioned mass of the piece or sample, in grams (g);

Mua is the mass per unit area, in grams per square metre (g/m^2);

W_c is the conditioned width of the piece or sample, in metres (m).

8 Test report

The test report shall include the following particulars:

a) a statement that the test was performed in accordance with this British Standard, i.e. BS 2471:2005;
b) where more than one specimen is tested, the result for each specimen;
c) the date of the test;
d) the mean mass per unit length, in grams per metre, and/or area, in grams per square metre;
e) the method (1, 2, 3) by which each result was obtained;
f) whether or not the results include the selvedge;
g) details of any deviation from the specified test procedure.

Bibliography

BS EN 12127:1998, *Textiles — Fabrics — Determination of mass per unit area using small samples.*

ISO 3801:1977, *Methods of test for textiles — Woven fabrics — Determination of mass per unit length and mass per unit area.*

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