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Textiles — Bursting properties of fabrics —

Part 1: Hydraulic method for determination of bursting strength and bursting distension

Textiles — Propriétés de résistance à l'éclatement des étoffes — Partie 1: Méthode hydraulique pour la détermination de la résistance et de la déformation à l'éclatement

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 13938 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13938-1 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 38, *Textiles*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

ISO 13938 consists of the following parts, under the general title *Textiles — Bursting properties of fabrics*:

— *Part 1: Hydraulic method for determination of bursting strength and bursting distension*

— *Part 2: Pneumatic method for determination of bursting strength and bursting distension*

Annex A of this part of ISO 13938 is for information only.

Annex ZA provides a list of corresponding International and European Standards for which equivalents are not given in the text.

For the purposes of this part of ISO 13938, the CEN annex regarding fulfilment of European Council Directives has been removed.

Foreword

The text of EN ISO 13938-1:1999 has been prepared by Technical Committee CEN/TC 248 "Textiles and textile products", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 38 "Textiles".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2000, and conflicting national standards shall be withdrawn at the latest by February 2000.

It is a revision of ISO 2960:1974.

EN ISO 13938 is in two parts as follows:

prEN ISO 13938-1 Textiles - Bursting properties of fabrics - Part 1: Hydraulic method for determination of bursting strength and bursting distension (ISO/FDIS 13938-1:1998)

prEN ISO 13938-2 Textiles - Bursting properties of fabrics - Part 2: Pneumatic method for determination of bursting strength and bursting distension (ISO/FDIS 13938-2:1998)

NOTE: Normative references to International Standards are listed in annex ZA (normative).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard describes a hydraulic method for the determination of bursting strength and bursting distension of textile fabrics.

In this part a hydraulic pressure is applied using a constant rate of pumping device.

NOTE prEN ISO 13938-2 describes a method using pneumatic pressure.

The method is applicable to knitted, woven, nonwoven and laminated fabrics. It may be suitable for fabrics produced by other techniques. The test is suitable for test specimens in the conditioned or wet state.

From the available data there appears to be no significant difference in the bursting strength results achieved using hydraulic or pneumatic burst testers, for pressures up to 800 kPa. This pressure range covers the majority of performance levels expected of general apparel. For specialty textiles requiring high bursting pressures, the hydraulic apparatus is more suitable.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 139:1973	Textiles - Standard atmospheres for conditioning and testing
EN ISO 3696	Water for analytical laboratory use - Specification and test methods (ISO 3696:1987)
EN 30012-1:1993	Quality assurance requirements for measuring equipment - Part 1:Metrological confirmation system for measuring equipment (ISO 10012-1:1992)

3 Definitions

For the purposes of this standard the following definitions apply:

3.1 test area: Area of the test specimen within the circular clamping device.

3.2 bursting pressure (pressure at burst): Maximum pressure applied to a test specimen clamped over an underlying diaphragm until the test specimen ruptures.

3.3 bursting strength (strength at burst): Pressure obtained by subtracting the diaphragm pressure from the mean bursting pressure.

3.4 diaphragm pressure: Pressure applied to the diaphragm, with no test specimen present, to distend it to the mean bursting distension of the test specimen.

3.5 bursting distension (distension at burst): Expansion of a test specimen at the bursting pressure.

It is expressed either as height at burst or as volume at burst.

3.6 height at burst: Distance between the upper surface of the test specimen before distension and the top of the test specimen at the bursting pressure.

3.7 volume at burst: Volume of pressurizing fluid pumped at the bursting pressure.

3.8 time to burst: Time taken to distend a test specimen to burst.

4 Principle

A test specimen is clamped over an expansive diaphragm by means of a circular clamping ring. Increasing fluid pressure is applied to the underside of the diaphragm, causing distension of the diaphragm and the fabric. The volume of fluid is increased at a constant rate per unit time until the test specimen bursts. The bursting strength and bursting distension are determined.

5 Sampling

Either select samples in accordance with the procedure laid down in the material specification for the fabric, or as agreed between the interested parties. In the absence of an appropriate material specification, an example of a suitable sampling procedure is given in annex A. Avoid areas that are folded or creased, selvedges and areas not representative of the fabric. The system of clamping used generally permits tests to be applied without cutting out test specimens.

6 Apparatus

6.1 Bursting tester

Metrological confirmation of the bursting tester shall be carried out in accordance with

EN 30012-1:1993.

The bursting tester shall comply with the following requirements:

6.1.1 The apparatus shall be capable of producing various constant rates of increase in volume per unit time between 100 cm^3/min and 500 cm^3/min to within ±10 % of the indicated value. If the apparatus is not equipped to adjust fluid volume, a testing time to burst of (20 ±5) s may be applied. This shall be indicated in the test report.

6.1.2 Bursting pressure shall be indicated with an accuracy of ±2 % of full scale range above the first 20 % of range.

6.1.3 Height at burst up to 70 mm shall be indicated with an accuracy of ±1 mm. Zero position of the measuring gauge shall be adjustable to accommodate the thickness of the test specimen.

6.1.4 Means for indicating the volume at burst (if available) to within ±2 % of the indicated value.

6.1.5 A test area of 50 cm^2 (79,8 mm diameter) shall be used.

Other test areas of 100 cm^2 (112,8 mm diameter) or 10 cm^2 (35,7 mm diameter) or 7,3 cm^2 (30,5 mm diameter) may be used, if the preferred test area is not applicable in the existing testing equipment, or due to high or low expansion of the fabric or other fabric requirements, or by mutual agreement.

6.1.6 The clamping device shall provide for clamping of the test specimen securely without distortion or damage and prevent slippage during the test. The clamping ring shall allow undisturbed vaulting of highly expansive fabrics (e.g. fabric test specimens whose height at burst is greater than half of the test specimen diameter). All test specimen clamping ring inner diameters shall be accurate to ±0,2 mm. To avoid test specimen damage a small curvature at the inner edge of the clamping ring facing the test specimen is recommended.

6.1.7 A safety cover shall enclose the clamping device during the test when the expansion of the test specimen takes place. It shall allow clear observation of the expansion of the test specimen during the test.

6.1.8 The diaphragm shall meet the following requirements:

- thickness up to 2 mm;
- highly expansive;
- if the diaphragm is to be used several times, it shall be elastic within the range of height at burst observed during the test;
- resistant against pressurizing fluids used.

7 Atmospheres for conditioning and testing

The atmospheres for preconditioning, conditioning and testing shall be as specified in ISO 139:1973.

Preconditioning and conditioning are not required for wet tests.

8 Procedure

8.1 Prior to testing the sample shall be conditioned in the relaxed state in accordance with clause 7. During conditioning and testing maintain the test specimens in the atmosphere for conditioning and testing in accordance with clause 7.

8.2 Set a test area of 50 cm^2 (see 6.1.5).

NOTE 1 : For most fabrics, particularly knitted fabrics, the test area of 50 cm^2 is applicable. For fabrics with low extensibility (known from previous experience or preliminary testing), e.g. for fabrics for technical application, a test area of 100 cm^2 is recommended. In cases where these conditions cannot be met or are not appropriate alternative test areas in accordance with 6.1.5 may be used if mutually agreed.

NOTE 2 : Comparison of results requires the test to be performed with the same test areas and rates of increase in volume.

8.3 Set a constant rate of increase in volume of between 100 cm^3/min and 500 cm^3/min depending on test area and fabric requirements. Or adjust a time to distend a test specimen to burst of (20 ±5) s using preliminary trials, if a constant rate of increase in volume is not applicable.

8.4 Place the test specimen over the diaphragm so that it lies in a flat tensionless condition, avoiding distortion in its own plane. Clamp it securely in the circular holder, avoiding jaw damage, to prevent slippage during the test. Place the distension recording device into the measuring position and adjust it to the zero position. Fasten the safety cover in position according to machine requirements. Apply pressure to the test specimen until the fabric bursts.

Immediately after burst, reverse the apparatus to starting position. Note bursting pressure and height at burst and/or bursting volume. If the test specimen bursts close to the edge of the clamping device, report this fact. Reject jaw breaks occurring within 2 mm of the clamping line. Repeat the test at least four more times at different places on the fabric. The number of test specimens may be increased if agreed mutually.

8.5 Diaphragm correction

With the same test area and rate of increase in volume or time to burst as that employed in the above tests, distend the diaphragm without the presence of a test specimen by an amount equal to the mean height at burst or the mean volume at burst of the test specimen. Note the pressure at this distension of the diaphragm as the "diaphragm pressure".

8.6 Wet test

For tests in the wet condition, immerse the test specimen for a period of 1 h in grade 3 water in accordance with EN ISO 3696:1995 at a temperature of (20 ±2) °C. For tropical regions, temperature according to ISO 139:1973 may be used. An aqueous solution containing not more than 1 g of a nonionic wetting agent per litre may be used instead of water. Immediately after removal of a test specimen from the liquid and briefly placing it on blotting paper to remove excess water, perform the test according to 8.2 to 8.5.

9 Calculation and expression of results

9.1 Calculate the arithmetic mean of the bursting pressure values in kilopascals. From this subtract the diaphragm pressure in kilopascals as determined according to 8.5 to obtain the bursting strength. Round the result to three significant figures.

9.2 Calculate the arithmetic mean of the height at burst values in millimetres. Round the result to two significant figures.

9.3 If required, calculate the arithmetic mean of the volume at burst values in cubic centimetres. Round the result to three significant figures.

9.4 If required, calculate the coefficient of variation and the 95 % confidence limits for the bursting pressure and height at burst and, if required, volume at burst. Round the coefficient of variation to the nearest 0,1 % and the 95 % confidence limits in accordance with the mean values.