
**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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 24, *Conditioning atmospheres and physical tests for textile fabrics*.

This second edition cancels and replaces the first edition (ISO 13938-1:1999), of which it constitutes a minor revision.

The changes compared to the previous edition are as follows:

— the normative references have been updated.

A list of all parts in the ISO 13938 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Textiles — Bursting properties of fabrics —

Part 1:

Hydraulic method for determination of bursting strength and bursting distension

1 Scope

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

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

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

The method is applicable to knitted, woven, nonwoven and laminated fabrics. It can 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 speciality textiles requiring high bursting pressures, the hydraulic apparatus is more suitable.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 10012, *Measurement management systems — Requirements for measurement processes and measuring equipment*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

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* (3.4) from the mean *bursting pressure* (3.2)

3.4
diaphragm pressure

pressure applied to the diaphragm, with no test specimen present, to distend it to the mean *bursting distension* (3.5) of the test specimen

3.5
bursting distension
distension at burst

expansion of a test specimen at the *bursting pressure* (3.2)

Note 1 to entry: It is expressed either as *height at burst* (3.6) or as *volume at burst* (3.7).

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* (3.2)

3.7
volume at burst

volume of pressurizing fluid pumped at the *bursting pressure* (3.2)

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, selvages 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 ISO 10012.

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 cm³/min and 500 cm³/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 cm² (79,8 mm diameter) shall be used.

Other test areas of 100 cm² (112,8 mm diameter) or 10 cm² (35,7 mm diameter) or 7,3 cm² (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 $\pm 0,2$ 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.

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 cm² (see [6.1.5](#)).

For most fabrics, particularly knitted fabrics, the test area of 50 cm² 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 cm² 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.

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 cm³/min and 500 cm³/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 wet condition, immerse the test specimen for a period of 1 h in grade 3 water in accordance with ISO 3696 at a temperature of (20 ± 2) °C. For tropical regions, temperature according to ISO 139 may be used. An aqueous solution containing not more than 1 g of a non-ionic 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 (kPa). From this, subtract the diaphragm pressure in kilopascals (kPa) 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.

10 Test report

The test report shall include the following information.

10.1 General

- a) The number and year of publication of this document, i.e. ISO 13938-1:2019, and date of test;
- b) identification of test sample and sampling procedure, if required;
- c) make and model of bursting tester used;
- d) test area used, in square centimetres;
- e) rate of increase in volume or time to burst;
- f) number of test specimens tested and number of bursts close to clamping device and number of tests rejected;
- g) observation of bursting behaviour (e.g. rupture of one or both yarn directions);
- h) state of test (conditioned or wet);
- i) any deviation from the given procedure.

10.2 Test results

- a) Mean bursting strength, in kilopascals (kPa);
- b) mean height at burst, in millimetres;
- c) mean volume at burst, in cubic centimetres, if required;
- d) the coefficient of variation of the relevant values, in percent, if required;
- e) the 95 % confidence limits, in units of the relevant mean values, if required.