INTERNATIONAL STANDARD

**ISO 811**

Second edition
2018-03

# Textiles — Determination of resistance to water penetration — Hydrostatic pressure test

*Textiles — Détermination de la résistance à la pénétration de l'eau — Essai sous pression hydrostatique*



Reference number
ISO 811:2018(E)



ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

# Contents

Page

**Foreword** ..... **iv**
**1 Scope** ..... **1**
**2 Normative references** ..... **1**
**3 Terms and definitions** ..... **1**
**4 Principle** ..... **1**
**5 Reagents** ..... **1**
**6 Apparatus** ..... **2**
**7 Atmosphere for conditioning and testing** ..... **2**
**8 Test specimen** ..... **3**
**9 Test procedure** ..... **3**
**10 Calculations and expression of results.** ..... **4**
**11 Test report** ..... **4**
**Bibliography** ..... **5**

# 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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

This second edition cancels and replaces the first edition (ISO 811:1981).

The main changes to the previous edition are as follows:

— the first element of the title changed from *Textile fabrics* to *Textiles* to be in line with other TC 38/SC 2 documents;

— in the Scope, clarification that the applicability of the method is intended for water resistant fabrics;

— major editorial changes were made throughout the document to bring it up to date.



 

# Textiles — Determination of resistance to water penetration — Hydrostatic pressure test

## 1 Scope

This document specifies a hydrostatic pressure method for determining the resistance of fabrics to penetration by water. The method is applicable to all types of fabrics which are intended to be water resistant whether or not they have been given a water-resistant or water-repellent finish.

## 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*

## 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**
**face**
fabric surface intended to be the outer visible side in an end product

## 4 Principle

The hydrostatic head supported by a fabric is a measure of the opposition to the passage of water through the fabric. A specimen is subjected to a steadily increasing pressure of water on one side of the fabric, under standard conditions, until penetration occurs in three places. The pressure at which the water penetrates the fabric at the third place is noted. The water pressure may be applied from below or from above the test specimen. The chosen alternative shall be stated in the test report.

The result is immediately relevant to the behaviour of fabric articles which are subjected to water pressure for short or moderate periods of time.

## 5 Reagents

**5.1 Water**, grade 3 water in accordance with ISO 3696.

The water is in contact with the test specimen at either 20 °C ± 2 °C or 27 °C ± 2 °C. The chosen alternative shall be stated in the test report. (The use of water at the higher temperature will yield lower values of hydrostatic head; the magnitude of this effect may vary from fabric to fabric.)

## 6 Apparatus

The usual laboratory apparatus and, in particular, the following.

### 6.1 Fabric clamp.

It should be possible to clamp the specimen of fabric in such a way that

a) it is horizontal and is not bulging;

b) an area of the fabric of 10 000 $mm^2$ (100 $cm^2$) is subjected to steadily increasing water pressure from below or from above the fabric;

c) no leakage of water takes place at the clamps during the test period;

d) the specimen does not slip in the clamps;

e) any tendency for penetration to occur at the clamped edge of the specimen is minimized.

With some forms of apparatus, it is recommended that the clamps are faced with a suitable grade of rubber. It can be helpful to use a sealing wax around the clamps to help prevent water from leaking.

### 6.2 Mechanism for measuring the increase in water pressure.

The rate of increase of water pressure shall be 10 cm $H_2O$/min ± 0,5 cm $H_2O$/min or 60 cm $H_2O$/min ± 3 cm $H_2O$/min (9,8 mbar $H_2O$/min ± 0,5 mbar $H_2O$/min or 58,8 mbar $H_2O$/min ± 2,9 mbar $H_2O$/min). Results obtained by different rates may not be the same. The chosen alternative rate shall be stated in the test report.

NOTE The higher rate of increase of water pressure is more applicable when testing fabrics with high water resistance.

### 6.3 Manometer (for manual types of equipment that are not electronic).

The accuracy of the manometer, if used, shall be stated in the test report. If used, the following conditions apply.

a) It is necessary to provide a manometer of suitable range.

   1) A manometer which provides for pressures up to 1 m $H_2O$ is suitable for fabrics similar in construction to gabardines.

   2) For fabrics of closer construction, it is advisable to use a manometer which provides for pressures up to 2 m $H_2O$.

b) If more than one testing head is used in conjunction with the manometer, means shall be provided for separately disconnecting them. This is to prevent a high rate of leakage through test specimens already penetrated at three places. With most forms of apparatus, such a leakage can markedly reduce the rate of increase of pressure on the remaining specimens still under test.

## 7 Atmosphere for conditioning and testing

Conditioning and testing shall be carried out according to ISO 139. If so agreed, conditioning and testing may be carried out in the ambient temperature.

The presence of vapours of volatile organic liquids, such as diethyl ether, in the laboratory when this test is being carried out can affect the results.

## 8 Test specimen

After receipt, handle the fabric as little as possible, avoid folding it sharply and do not treat it in any way (e.g. by ironing it) other than by conditioning.

Take at least five test specimens from different places in the fabric so that they do not contain the same yarns and represent the material as fully as possible. The fabric may be tested without cutting specimens.

Areas with deep creases or fold marks shall not be tested.

## 9 Test procedure

**9.1** Provide freshly distilled water (5.1) for each specimen tested.

If the instrument used is of the type in which the water to be used for testing is contained in the testing head(s) and rises to come into contact with the specimen, the surface of the water in the testing head(s) may be cleaned in one of the following ways, stated in order of preference.

a) Empty the testing head(s) and refill with sufficient freshly distilled water.

b) Allow the distilled water to overflow from the testing head(s) so that the surface of the water is cleared. Sweep the surface of the water with a glass slide freshly coated with paraffin wax.

c) Allow the distilled water to overflow from the testing head(s) so that the surface of the water is cleared.

**9.2** Wipe all the water from the clamping surfaces. Clamp (6.1) the conditioned specimen in the test head so that the face of the fabric will be in contact with the water. The clamping shall be carried out in such a way that water will not be forced through the specimen prior to the start of the test. Subject the specimen immediately to increasing water pressure (6.2). Watch continuously for evidence of penetration by water.

**9.3** Record the pressure, as centimetres or millibars of water, at which water first appears at the third place in the specimen. If agreed between parties, the appearance of the first drop can be reported and shall be stated in the test report. The accuracy for recording the pressure shall be as noted in Table 1.

**Table 1 — Accuracy for recording the pressure**

| Pressure range | Pressure accuracy |
|---|---|
| < 1 m $H_2O$<br>(< 98 mbar $H_2O$) | 0,5 cm $H_2O$<br>(0,5 mbar $H_2O$) |
| ≥ 1 m $H_2O$ and ≤ 2 m<br>(≥ 98,1 mbar $H_2O$ and ≤ 196 mbar $H_2O$) | 1 cm $H_2O$<br>(1 mbar $H_2O$) |
| > 2 m $H_2O$<br>(> 196 mbar $H_2O$) | 2 cm $H_2O$<br>(2 mbar $H_2O$) |
| NOTE The pressure of the apparatus is generally expressed in cm $H_2O$ or mbar $H_2O$. The SI unit, Pa (Pascal), is unusual for this test. | |

**9.4** Do not take into account very fine droplets which do not grow after being formed. Count subsequent drops which penetrate through the same place in the fabric as one drop. Note whether the penetration of water occurs at the edge of the clamp and reject as unsatisfactory any test in which such penetration occurs. Test further specimens until reproducible results are obtained.

If this procedure is used for quality control or to support broad product claims for barrier properties used in protective clothing, proper statistical design and analysis of larger data sets than those

specified in this test method should be performed. Examples of acceptable sampling plans are found in references such as ISO 2859-1.

## 10 Calculations and expression of results.

Calculate the mean of the pressures recorded for the specimens tested according to 9.3. Report the individual results and the mean result in centimetres or millibars of water.

## 11 Test report

The test report shall include the following information:

a) reference to this document;

b) the atmosphere used (standard temperate or standard tropical or other atmosphere);

c) the temperature of the water (20 °C or 27 °C or other temperature);

d) whether the water pressure was applied from below or from above the test specimen;

e) the rate of increase of water pressure, (10 $H_2O$ or 60 cm $H_2O$/min);

f) which side of the fabric was tested, if not the face;

g) any variation in size or shape of the test specimen;

h) the individual results and their mean;

i) any deviations from the given procedure;

j) the accuracy of the manometer, if used;

k) the pressure at which water first appears if other than the third place;

l) date of the test.