INTERNATIONAL STANDARD

ISO 9073-16

First edition
2007-12-01

Textiles — Test methods for nonwovens —

Part 16: Determination of resistance to penetration by water (hydrostatic pressure)

Textiles — Méthodes d'essai pour nontissés —

Partie 16: Détermination de la résistance à la pénétration de l'eau (pression hydrostatique)

Reference number
ISO 9073-16:2007(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 2.

The main task of technical committees is to prepare International Standards. 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 the member bodies casting a vote.

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.

ISO 9073-16 was prepared by Technical Committee ISO/TC 38, *Textiles*.

ISO 9073 consists of the following parts, under the general title *Textiles — Test methods for nonwovens*:

— *Part 1: Determination of mass per unit area*

— *Part 2: Determination of thickness*

— *Part 3: Determination of tensile strength and elongation*

— *Part 4: Determination of tear resistance*

— *Part 5: Resistance to mechanical penetration (ball burst procedure)*

— *Part 6: Absorption*

— *Part 7: Determination of bending length*

— *Part 8: Determination of liquid strike-through time (simulated urine)*

— *Part 9: Determination of drapability including drape coefficient*

— *Part 10: Lint and other particles generation in the dry state*

— *Part 11: Run-off*

— *Part 12: Demand absorbency*

— *Part 13: Repeated liquid strike-through time*

— *Part 14: Coverstock wetback*

— *Part 15: Determination of air permeability*

— *Part 16: Determination of resistance to penetration by water (hydrostatic pressure)*

— *Part 17: Determination of water penetration (spray impact)*

— *Part 18: Determination of breaking strength and elongation of nonwoven materials using the grab tensile test*

Textiles — Test methods for nonwovens —

Part 16: Determination of resistance to penetration by water (hydrostatic pressure)

1 Scope

This part of ISO 9073 describes the hydrostatic pressure test that measures the resistance of nonwoven fabrics to the penetration of water under varied hydrostatic head pressures.

This part of ISO 9073 applies to any nonwoven fabrics which are intended for use as a barrier to the penetration of fluids.

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.

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

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

ISO 3951-5, *Sampling procedures for inspection by variables — Part 5: Sequential sampling plans indexed by acceptance quality limit (AQL) for inspection by variables (known standard deviation)*

ISO 10012:2003, *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.

3.1
hectopascal
millibar
unit of atmospheric pressure equal to 100 N/m^2 or 0,000 981 m of a water column

3.2
water resistance of nonwoven materials
fabric characteristics which are resistant to wetting and penetration by water

4 Principle

A nonwoven fabric specimen is mounted to form the cover on the test-head reservoir. This specimen is subjected to a standardized water pressure increase at a constant rate, until leakage appears on the outer surface of the nonwoven. The test results for the hydrostatic water pressure test are measured at the point where the first drops appear in three separate areas on the specimen.

5 Apparatus

5.1 Hydrostatic testing apparatus, with the following components: (see Figures 1 and 2 for examples of two different types of hydrostatic head-testing equipment)

5.1.1 A levelling mechanism that maintains the specimen horizontally.

5.1.2 A clamping mechanism which does not allow water leakage, specimen damage or specimen slippage.

5.1.3 A means of maintaining the temperature of the water that comes into contact with the specimen (from below or above) at (23 ± 2) °C.

NOTE Alternative temperatures can be used, if agreed by interested parties and noted in the test report.

5.1.4 A means of controlling the rate of increase of the water pressure, at either (10 ± 0,5) cm H_2O/min or (60 ± 3) cm H_2O/min.

5.1.5 A test-head reservoir with a circular test area of (100 ± 1) cm^2.

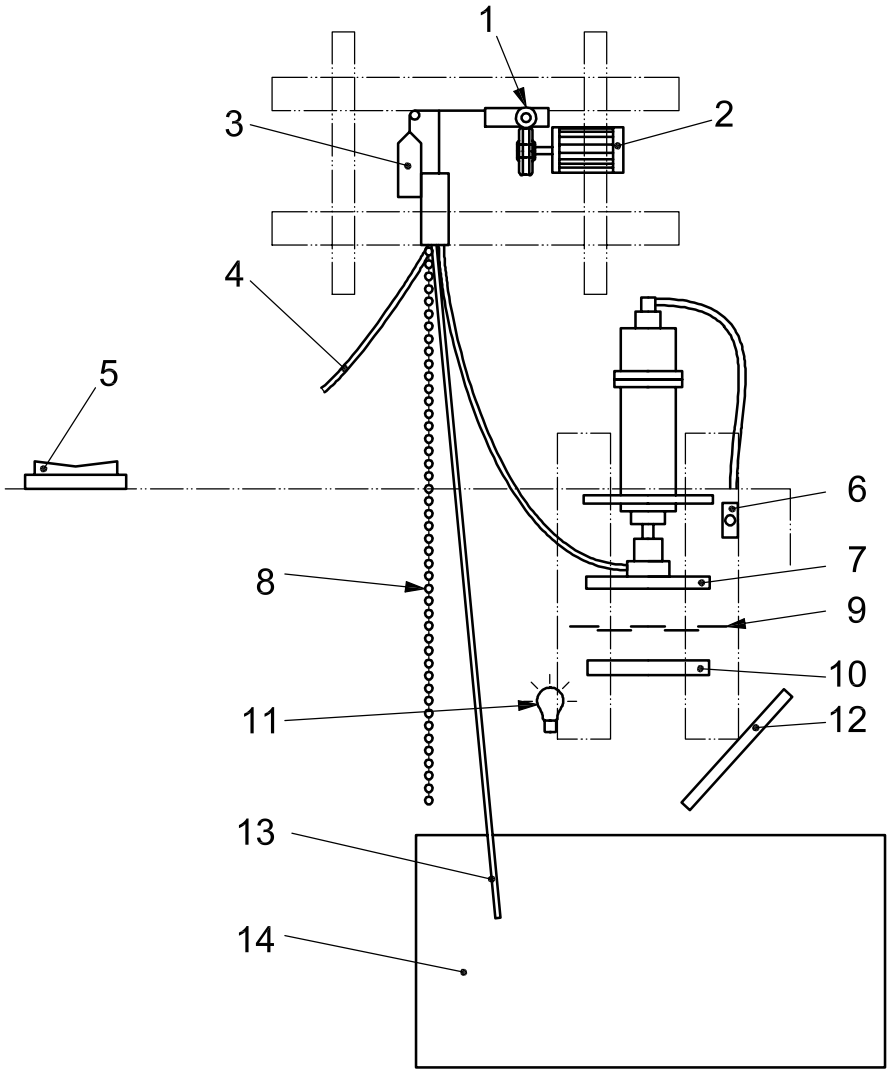
NOTE Other sizes can be used if agreed between interested parties and noted in the test eport.

5.2 Optional nylon netting, 20 cm × 20 cm square piece of netting with approximately 3 cm holes.

When testing some nonwovens that exhibit low tensile strength, such as a meltblown fabric, a nylon web or net screen may be used to support the sample. This would simulate the effect of a bonded laminate and prevent the weight of the water from tearing or stretching the material. The use of the nylon support should be agreed upon by all parties and all parties should be fully aware of its effects. The test in this part of ISO 9073 is normally done without the use of the nylon support.

5.3 Stop watch, calibrated to 0,1 s.

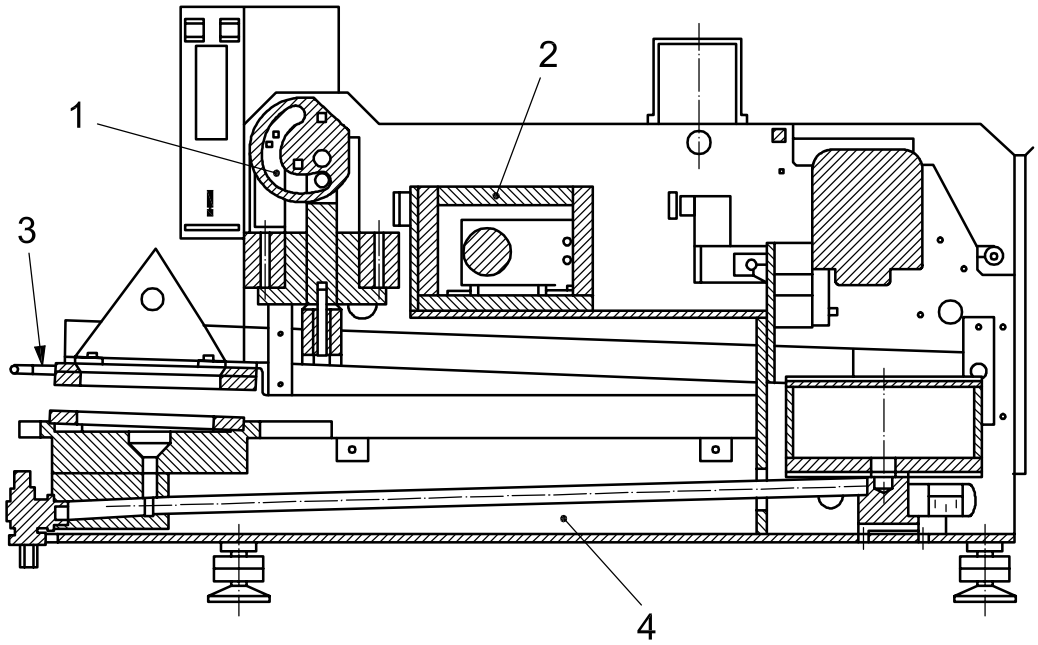
5.4 Cutting dies or **templates**, to cut specimens having dimensions at least equal to the area of the clamping surfaces of the test apparatus (optional), or paper cutter.



Key

1	worm gear	8	beaded chain
2	motor	9	specimen
3	weight	10	lower plate
4	heated water supply	11	light
5	motor switch	12	mirror
6	clamping valve lever	13	drain
7	upper plate	14	sink

Figure 1 — Example of suitable test equipment



Key

1 pressure mechanism
2 pressurizing system
3 measuring area
4 frame

Figure 2 — Alternative test equipment

6 Calibration

6.1 The metrological confirmation of the test apparatus shall be in compliance with Clause 7, Figure 2 and Annex A of ISO 10012:2003; also use the following steps:

The set-up procedures for machines from different manufacturers may vary. Prepare and verify calibration of the hydrostatic tester as directed in the manufacturer's instructions.

6.2 For the best results, level the test instrument.

6.3 Verify calibration for the range of water pressure expected for the material to be tested.

6.4 If a column of water is used, be sure to calibrate the incoming water supply for a rate of $(10 \pm 0{,}5)$ cm H_2O/min or (60 ± 3) cm H_2O/min and a temperature of (23 ± 2) °C.

7 Procedure

7.1 Prepare the samples in accordance with ISO 3951-5. Unless otherwise specified, test five specimens, evenly spaced across the available cross-directional width, from each sample.

7.2 Bring the specimens from the prevailing atmosphere to moisture equilibrium for testing in the standard atmosphere as specified in ISO 139. If agreed upon by all parties, conditioning and testing may be carried out without preconditioning the test specimens.

Care in handling should be observed so that specimens do not contact any contaminants, such as soap, salt, oil, etc., which might facilitate or hinder water penetration. No dirt or other foreign material should be allowed on the specimen.

7.3 Specimens should be cut large enough to be tested on the 100 cm^2 head, or they may be left in long strips if this is compatible with the test equipment.

7.4 Fresh grade 3 water complying with ISO 3696 should be provided for the testing of each new specimen.

7.5 Carefully clean the clamping surfaces of all water and debris, and of anything that could alter the seal.

7.6 Carefully place the test specimen on the test head, close the clamps and start the test.

If the test equipment has a water reservoir in the test head, be sure that the water forms a convex surface. Carefully slide the specimen onto the surface of the water in the test head so that the face of the specimen is in contact with the water. Do not allow air to be caught under the specimen.

7.7 Observe the specimen surface and watch for water passing through the specimen. The test is complete when three separate drops are formed. However, these drops should form three different penetrating holes. Read the water pressure from the display or read the centimetres from the manometer.

8 Calculation

8.1 Report the water penetration of individual specimens. Record, in centimetres/millibars, the height of the water when penetration of the material took place. If other units are read, convert to centimetres if necessary.

8.2 Report the water penetration average. Calculate the average height of the water when penetration took place. Calculate the average test results for each laboratory sample.

8.3 Calculate the standard deviation and coefficient of variation of the test (if required) to the nearest hectopascal or centimetre in accordance with Table 1. Report the average and standard deviation of the results obtained from at least five specimens.

Table 1 — Reporting precision

Up to 100 hPa	0,5 hPa	Up to 1 m H_2O	0,5 cm
Over 100 hPa	1,0 hPa	Over 1 m H_2O	1,0 cm

8.4 When data are automatically computer-processed, calculations are generally contained in the associated software. It is recommended that computer-processed data be verified against known property values and its software described in the test report.

9 Test report

The test report shall include the following information:

— a reference to this part of ISO 9073;

— type or designation of material tested;

— where the water pressure was applied, from below or above the specimen;

— water temperature used, (23 ± 2) °C or another agreed temperature;

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

— side of the fabric tested, face or anvil;

— number of samples/specimens tested;

— testing conditions;

— identification of software used, if data was computer-processed;

— individual results and their averages;

— any deviation from the procedure described in this part of ISO 9073;

— average and standard deviation of the hydrostatic head (expressed in cm H_2O/min or HPa/min).

Annex A
(informative)

General information regarding reproducibility

This study was done using

— water pressure from below,

— water at (23 ± 2) °C,

— water pressure at a rate of 60 hPa/min,

— the face side of the fabric,

— five different materials, three specimens of each, and

— standard conditions in accordance with ISO 139.

In this experiment, six different laboratory technicians tested three specimens from each of five materials.

Since this is a destructive test, the estimate is a combination of measurement error and sample-to-sample variation. The material used in this experiment was chosen in such a way as to minimize sample-to-sample variation.

Summary of precision parameters: S_r is the repeatability standard deviation; S_R is the reproducibility standard deviation. See Table A.1.

Table A.1 — Precision data

Material	Average	S_r	S_R
A	103,06	25,89	25,89
B	32,92	3,60	4,59
C	37,11	5,76	5,76
D	11,69	1,03	1,25
E	76,64	5,37	5,91

ICS 59.080.30

Price based on 7 pages