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**Textiles — Determination of resistance  
to water absorption — Tumble-jar  
absorption test**

*Textiles — Détermination de la résistance à l'absorption d'eau — Essai  
d'absorption à l'aide d'un pot culbuteur*

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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 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 18696 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

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# Textiles — Determination of resistance to water absorption — Tumble-jar absorption test

## 1 Scope

This International Standard is applicable to any textile fabric, which may or may not have been given a water-resistant or water-repellent finish. It measures the resistance of fabrics to wetting by water by the tumble-jar absorption test. It is particularly suitable for measuring the water-repellent efficacy of finishes applied to fabrics, because it subjects the treated fabrics to dynamic conditions similar to those often encountered during actual use.

The test is not intended for use in predicting rain-penetration resistance of fabrics, since it measures absorption of water into, but not through, the fabric. It is intended to determine a fabric's ability to resist water absorption and can be used to predict the probable weight gain of a garment in actual use. The test is best suited for fabrics used in garments for severe wet environmental conditions over an extended time.

## 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*

## 3 Terms and definitions

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

### 3.1

#### **absorbency**

propensity of material to take in and retain a liquid, usually water, in the pores and interstices of the material

### 3.2

#### **water repellency**

characteristic of a fiber, yarn or fabric to resist wetting

## 4 Principle

Prewighed specimens are tumbled in water for a fixed period of time and are reweighed after the excess water has been removed from them. The percentage increase in mass is taken as a measure of the absorption or resistance to internal wetting.

## 5 Safety precautions

**IMPORTANT — Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.**

These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this International Standard. Manufacturers should be consulted for specific details, such as material safety sheets and other manufacturer's recommendations.

## 6 Apparatus

**6.1 Dynamic Absorption Tester** <sup>1)</sup>, or similar mechanical rotating cylinder or hexagonal container measuring  $145 \pm 10$  mm (diameter)  $\times$   $300 \pm 5$  mm (length), made of glass, ceramic or corrosion-resistant metal mounted to tumble end-over-end about its mid point with a constant tangential velocity of  $55 \pm 2$  rev/min. (See Figure 1.)

**6.2 Wringer (motor-driven)**, constructed so that the pressure on the top of the piece of fabric is maintained by a dead weight or lever system, such that the total pressure (resulting from the total of the dead weight or lever system and the weight of the roller) is  $(27,2 \pm 0,5)$  kg.

**6.3 Laboratory balance**, accurate to 0,1 g.

**6.4 White Textile Blotting Paper**,  $(0,71 \pm 1)$  mm in thickness, surface density  $(385 \pm 4,5)$  g/m<sup>2</sup>, and with an absorbent capacity of  $(200 \pm 30)$  % <sup>2)</sup>

**6.5 Water**, distilled.

**6.6 Plastic container**, or gallon leakproof resealable-type plastic bag to hold approximately 3,8 L.

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## 7 Conditioning

The fabric samples and the blotting paper should be conditioned for a minimum of 4 h before testing. Conditioning and testing shall be carried out in accordance with ISO 139. If conditioning and testing is carried out at atmospheres other than those stated in ISO 139, and agreed upon, the tolerances and measurement-device uncertainty directives noted in this standard shall be maintained.

## 8 Test specimen preparation and marking procedures

Test two specimens from each sample.

**8.1** Each specimen consists of five  $(20 \times 20)$  cm pieces cut on a  $0,79$  rad ( $45^\circ$ ) bias.

**8.2** Remove loose corner yarns and spread a drop of liquid latex or rubber cement on the yarn at the corner to prevent raveling.

**8.3** Mark a corner of each piece of specimen for identification as a part of the specimen set.

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1) The Dynamic Absorption Tester is the trade name of a product supplied by SDL Atlas LLC, 4114 N. Ravenswood Avenue, Chicago, IL 60613, USA; Tel: +1-773-327-4520; Fax: +1-773-327-5787. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent apparatus may be used if it can be shown to lead to the same results.

2) White Textile Blotting Paper is the trade name of a product supplied by AATCC, PO Box 12215, Research Triangle Park, NC 27709-2215, USA; Tel: +1-919-549-8141; Fax: +1-919-549-8933; <http://www.aatcc.org/>. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

## 9 Procedure

**9.1** Rinse the tumble jar of the Dynamic Absorption Tester thoroughly to free it from all extraneous matter, particularly soaps, detergents and wetting agents.

**9.2** Place the five pieces of each specimen together on the scale (constituting a specimen set) and weigh to the nearest 0,1 g.

**9.3** Pour 2 L of distilled water at  $(27 \pm 1) ^\circ\text{C}$  into the tumble jar of the Dynamic Absorption Tester. Put both specimen sets into the jar and rotate for 20 min.

**9.4** Remove a piece of one specimen, immediately passing it through the wringer at a rate of 2,5 cm/s, with the edge of the piece parallel to the rolls, and then sandwich the specimen between two pieces of unused blotter paper and pass it through the wringer again. Leave the piece sandwiched in the wet blotters. Repeat this process for the remaining four pieces of the same specimen set. Then remove the blotters and roll the five pieces together, put them in a tared plastic container or sealable plastic bag, close the container and weigh the wet specimen set to the nearest 0,1 g. The mass of the wet specimen should not be more than twice its dry mass.

**9.5** Repeat 9.4 for the second specimen.

## 10 Evaluation

**10.1** Calculate the water absorbed for each specimen, to the nearest 0,1 %, using the following equation:

$$A_w = \frac{(m_{\text{wet}} - m_{\text{cond}})}{m_{\text{cond}}} \times 100$$

where

$A_w$  is the water absorbed, expressed as a percentage;

$m_{\text{wet}}$  is the mass of wet specimen, in grams;

$m_{\text{cond}}$  is the mass of conditioned specimen, in grams.

**10.2** Calculate the dynamic absorption of the fabric sample by averaging together the water absorbed by each of the two specimens.

## 11 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all information necessary for complete identification of the sample tested;
- c) the number of specimens tested;
- d) the conditioning and testing atmosphere used;
- e) any deviation from the procedure specified;
- f) the test results;
- g) the date of the test.



Figure 1 — Dynamic Absorption Tester



## Bibliography

- [1] AATCC Test Method 70 *Water Repellency: Tumble Jar Dynamic Absorption Test*

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