INTERNATIONAL STANDARD

**ISO 9073-6**

First edition
2000-12-01

# Textiles — Test methods for nonwovens —

## Part 6: **Absorption**

*Textiles — Méthodes d'essai pour nontissés —*

*Partie 6: Absorption*

Reference number
ISO 9073-6:2000(E)

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Printed in Switzerland

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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 the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 9073 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9073-6 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 6: Absorption*

— *Part 7: Determination of bending length*

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

— *Part 9: Determination of drape coefficient*

— *Part 10: Linting (dry state)*

— *Part 11: Run-off tests*

— *Part 12: Demand absorbency*

# Textiles — Test methods for nonwovens —

# Part 6: Absorption

## 1 Scope

This part of ISO 9073 describes methods for the evaluation of some aspects of the behaviour of nonwoven fabrics in the presence of liquids. In particular:

— the liquid absorbency time;

— the liquid absorptive capacity;

— the liquid wicking rate (capillarity).

It should be noted that these different aspects of absorbency may relate to various end uses of the tested products.

The tests are not applicable to any fabric containing super absorbent materials.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9073. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 9073 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*.

ISO 186:1994, *Paper and board — Sampling to determine average quality*.

ISO 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*.

## 3 Terms and definitions

For the purposes of this part of ISO 9073, the following terms and definitions apply.

**3.1**
**liquid absorbency time**
time required for a sample of absorbent material to become completely wetted by the test liquid, i.e. to imbibe a liquid into its interior structure under specified conditions

**3.2**
**liquid absorptive capacity**
**LAC**
mass of liquid that is absorbed by unit mass of the test absorbent expressed as a percentage of the mass of the test absorbent, under specified conditions and after a specified time

**3.3**
**liquid wicking rate**
measure of the capillarity of the test material, i.e. the rate at which the liquid is transported into the fabric by capillary action

# 4 Liquid absorbency time

## 4.1 Principle

The liquid absorbency time test measures the time required for the complete wetting of a specimen strip loosely rolled into a cylindrical wire basket and dropped on to the surface of the liquid from a height of 25 mm.

In this method the liquid can come into contact with all surfaces of the sample.

## 4.2 Apparatus

**4.2.1 Cylindrical wire basket,** open at one end, with height $(80 \pm 1)$ mm and diameter $(50 \pm 1)$ mm, and constructed of suitable gauge wire to obtain a mass of $(3 \pm 0{,}1)$ g, e.g. 0,5 mm diameter stainless steel wire. The mesh shall have openings approximately 20 mm square and be soldered in order to create a firm structure. Extra solder may be added to adjust the mass or the mass may be adjusted by partially doubling the rings, these extra lengths being distributed symmetrically in order to maintain the balance of the basket (see Figure1).

**4.2.2 Container for liquid,** of volume large enough to hold the submerged basket lying on its side.

**4.2.3 Stopwatch.**

**4.2.4 Specified liquid**, agreed-upon and specified and also identified in the test report.

## 4.3 Sampling

Carry out sampling in accordance with ISO 186.

## 4.4 Preparation and conditioning of test pieces

Cut five test pieces measuring $(76 \pm 1)$ mm in the machining direction and of sufficient length in the cross direction so that they each weigh $(5 \pm 0{,}1)$ g. These strips shall be equally spaced across the fabric sample.

When there is a difference in the surface characteristics of the fabric, it may be necessary to duplicate the test procedure so that each side of the fabric faces the internal surface of the basket.

Condition the test pieces in accordance with ISO 139.

The liquid shall be left long enough to equilibrate with the conditioning atmosphere.

Dimensions in millimetres

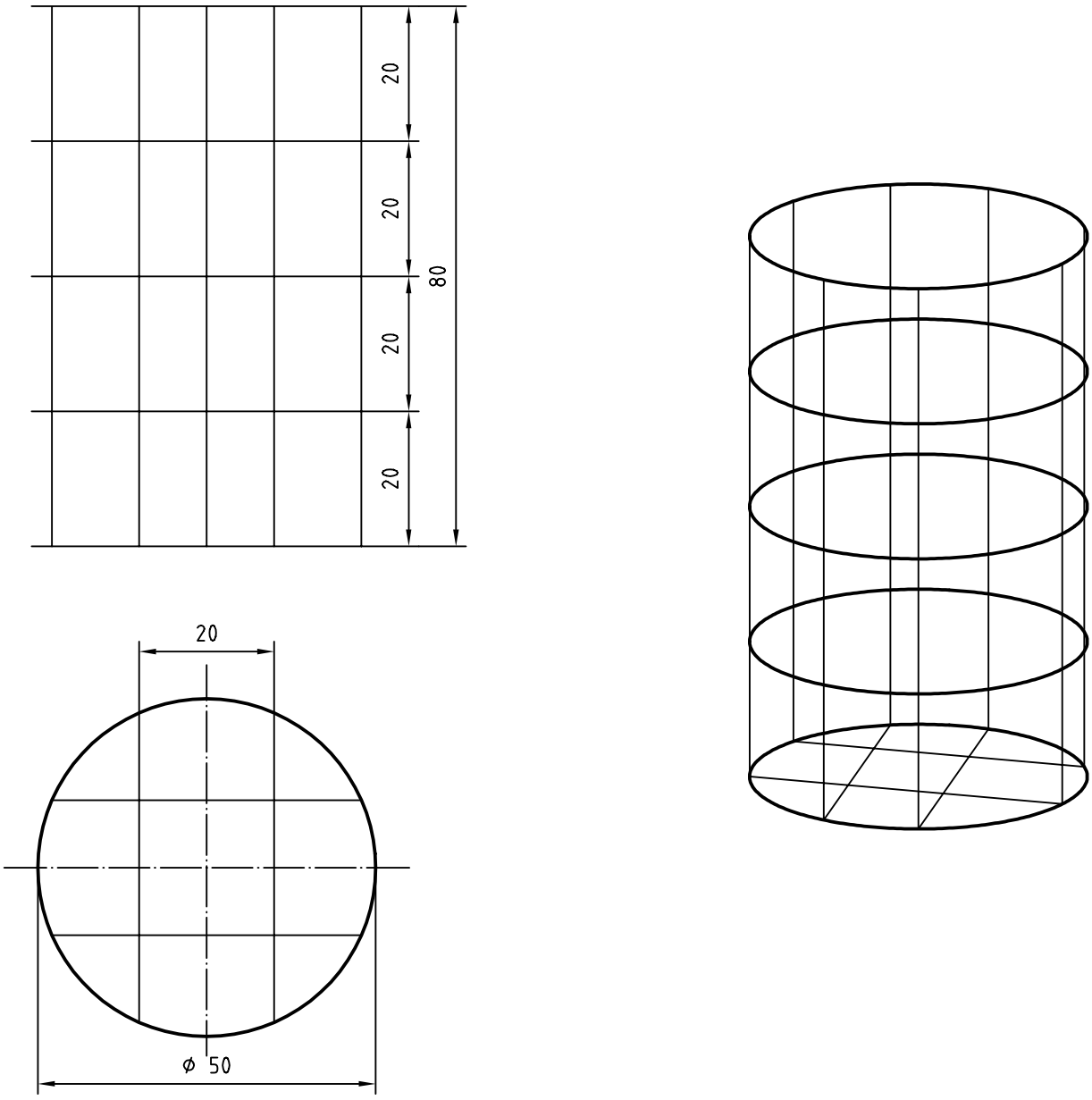



**Figure 1 — Cylindrical wire basket**

## 4.5 Procedure

Carry out the test in the standard atmosphere for testing (see ISO 139)

a) Loosely roll a test piece starting from the short end and place it in the basket (4.2.1).

b) Drop the basket, on its side, from a height of $(25 \pm 1)$ mm from the liquid surface into the container (4.2.2) of the specified liquid (4.2.4) and start the stopwatch (4.2.3).

c) Record the time taken for the basket to completely sink below the surface of the liquid.

Repeat with the other four test pieces.

Use fresh conditioned test liquid for each set of five test pieces.

### 4.6 Expression of results

Calculate the average liquid absorbency time, in seconds, and the standard deviation.

### 4.7 Test report

The test report shall include the following information:

a) reference to this part of ISO 9073, i.e ISO 9073-6;

b) identification of the test pieces;

c) dimensions of the test pieces;

d) identification of the liquid;

e) average liquid absorbency time and its standard deviation;

f) any deviation(s) from the standard procedure.

## 5 Liquid absorptive capacity

### 5.1 Principle

The absorptive capacity method provides a measure of the amount of liquid held within a test piece after specified times of immersion and drainage.

This method measures the liquid stored within the test piece itself after drainage has occurred vertically. For practical reasons, the drainage time is quite short. This is especially important if very volatile liquids are used, in which case an assessment of evaporation loss may be necessary.

### 5.2 Apparatus

**5.2.1 Wire gauze test piece support,** of at least 120 mm $\times$ 120 mm, with a metal frame. The gauze shall be made from a stainless steel test sieve of 2 mm nominal mesh size in accordance with ISO 565.

**5.2.2 Clips**, to hold the test piece on the gauze.

**5.2.3 Dish**, for containing the wire gauze with the test piece attached, of sufficient volume to allow a test liquid depth of 20 mm.

**5.2.4 Suitable weighing glass,** with cover.

**5.2.5 Balance,** capable of determining mass to an accuracy of $\pm$ 0,01 g.

**5.2.6 Stopwatch.**

**5.2.7 Specified liquid,** agreed-upon and specified and also identified in the test report.

### 5.3 Sampling

Carry out sampling in accordance with ISO 186.

## 5.4 Preparation and conditioning of test pieces

Cut five test pieces of (100 ± 1) mm × (100 ± 1) mm. If an individual test piece weighs less than 1 g, lay test pieces on top of each other to give each of the piles a total stacked mass of at least 1 g.

Condition the test pieces in accordance with ISO 139.

The liquid shall be left long enough to equilibrate with the conditioning atmosphere.

## 5.5 Procedure

Carry out the test in the standard atmosphere for testing (see ISO 139).

a) Weigh the test piece (or pile) to an accuracy of 0,01 g, using the balance (5.2.5) and the weighing glass with cover (5.2.4).

b) Place the test piece (or pile) on the stainless steel gauze (5.2.1), fastening it (them) at the edges with the clips (5.2.2).

c) Place the gauze with the attached test piece(s) approximately 20 mm below the liquid surface in the dish (5.2.3) and start the stopwatch (5.2.6). Introduce the gauze obliquely in order to avoid trapping air bubbles.

d) After (60 ± 1) s remove the gauze test piece support and test piece (or pile).

e) Remove all clips except one at one corner.

f) Hang freely and vertically to drain for (120 ± 3) s.

g) Take the test piece (or pile) off the gauze without squeezing the liquid from it, place the test piece in the weighing glass with cover and weigh.

Repeat b) to g) for the other four test pieces.

Use fresh conditioned test liquid for each set of five test pieces (or piles).

## 5.6 Expression of results

Calculate:

— The liquid absorptive capacity (LAC), in percent, of each test piece or each pile from the following:

$$\mathrm{LAC} = \frac{m_\mathrm{n} - m_\mathrm{k}}{m_\mathrm{k}} \times 100$$

where

$m_\mathrm{k}$ is the mass, in grams, of the dry test piece (or pile);

$m_\mathrm{n}$ is the mass, in grams, of the test piece (or pile) and absorbed liquid at the end of the test.

— The average liquid absorptive capacity of the five test pieces (or five piles) and the standard deviation.

### 5.7 Test report

The test report shall include the following information:

a) reference to this part of ISO 9073, i.e. ISO 9073-6;

b) identification of the test pieces;

c) dimensions of the test pieces;

d) identification of the liquid, including surface tension and measurement method used;

e) average liquid absorptive capacity and standard deviation;

f) any deviation(s) from the standard procedure.

## 6 Liquid wicking rate

### 6.1 Principle

The capillarity method measures the rate of vertical capillary rise in a specimen strip suspended in the test liquid.

NOTE This test method basically measures the rate of absorption of the nonwoven and difficulties could be encountered when judging and comparing the results obtained with anisotropic materials.

The use of colorant is not recommended. If it is used, the colorant shall be mentioned in the test report.

### 6.2 Apparatus

See Figure 2.

**6.2.1 Baseplate**, with levelling screws.

**6.2.2 Dish**, for the test liquid.

**6.2.3 Horizontal support**, which can be adjusted along a vertical support.

**6.2.4 Clamps on the horizontal support**, for fastening the test pieces.

**6.2.5 Measuring rod**, with a millimetre scale, fixed vertically on the horizontal support.

**6.2.6 Stopwatch.**

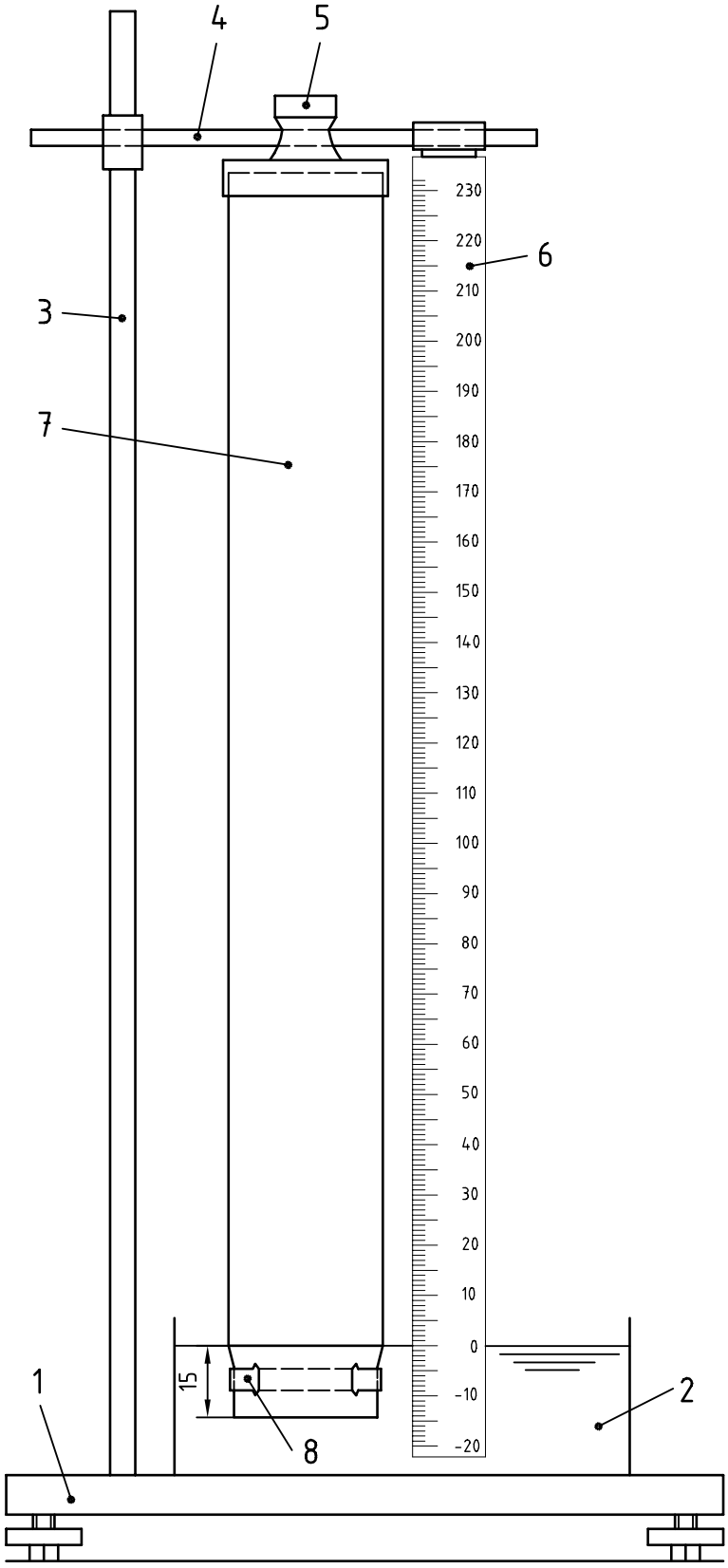
**6.2.7 Glass rods**, of 4 mm to 5 mm diameter and 30 mm in length.

**6.2.8 Specified liquid**, agreed-upon and specified and also identified in the test report.

### 6.3 Sampling

Carry out sampling in accordance with ISO 186.

Dimensions in millimetres




**Key**

| | | | | | |
|---|---|---|---|---|---|
| 1 | Baseplate | 4 | Horizontal support | 7 | Test piece |
| 2 | Dish | 5 | Clamp | 8 | Glass rod |
| 3 | Vertical support | 6 | Measuring rod | | |

**Figure 2 — Test apparatus for wicking rate measurement**

## 6.4 Preparation and conditioning of test pieces

Cut at least five test pieces $(30 \pm 1)$ mm wide $\times$ $(250 \pm 1)$ mm long in both the machining direction and the cross direction.

Punch two holes, $(5 \pm 1)$ mm diameter, out of one of the short ends of each test piece at $(5 \pm 1)$ mm from the short and the long sides.

Condition the test pieces in accordance with ISO 139.

The liquid shall be left long enough to equilibrate with the conditioning atmosphere.

## 6.5 Procedure

Carry out the test in the standard atmosphere for testing (see ISO 139).

a) Clamp the test piece vertically to the horizontal support (6.2.3) with the punched holes at the bottom.

b) Slot a glass rod (6.2.7) through the two holes to tension the test piece and maintain it vertical.

c) Place the test piece near and parallel to the measuring rod (6.2.5) and projecting $(15 \pm 2)$ mm below the zero point of the measuring rod.

d) Lower the horizontal support until the zero point of the measuring rod touches the liquid surface (the lower test piece edge is then $(15 \pm 2)$ mm below the surface).

e) At this moment start the stopwatch (6.2.6).

f) Record the height of capillary rise of the liquid after 10 s, 30 s, 60 s (and 300 s if required). If the capillary rise is not a uniform straight line, record the highest point.

Repeat a) to f) with the other four test pieces in the machining direction and the five test pieces in the cross direction

Use fresh conditioned test liquid for each set of ten test pieces.

## 6.6 Expression of results

Calculate the average capillary rise obtained on the five test pieces for each specified time, and the standard deviation:

— in the machining direction;

— in the cross direction.

Trace a curve using the data obtained from the above, so that the wicking rate can be calculated at a required time or at a required capillary rise.

## 6.7 Test report

The test report shall include the following information:

a) reference to this part of ISO 9073, i.e. ISO 9073-6;

b) identification of the test pieces;

c) identification of the liquid;

d) average capillary rise and standard deviation in the machine direction for specified times;

e) average capillary rise and standard deviation in the cross direction for specified times;

f) curves drawn from the data d) and e);

g) any deviation(s) from the standard procedure.

**ICS 59.080.30**

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