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**Textiles — Test methods  
for nonwovens —**

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

*Textiles — Méthodes d'essai pour nontissés —*

*Partie 13: Temps de transpercement successifs des liquides*



Reference number  
ISO 9073-13:2006(E)

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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 9073-13 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: Evaluation 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*

The following parts are under preparation:

- *Part 15: Evaluation of air permeability*
- *Part 16: Evaluation of water resistance (hydrostatic pressure test)*

- *Part 17: Evaluation of water penetration (spray impact) test*
- *Part 18: Determination of breaking strength and elongation of nonwoven materials using the grab tensile test*

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# Textiles — Test methods for nonwovens —

## Part 13: Repeated liquid strike-through time

### 1 Scope

This part of ISO 9073 specifies a test method for measuring the strike-through time (STT) for each of three subsequent doses of liquid (simulated urine) applied to the surface of a test piece of nonwoven coverstock. The STT is defined as the time taken for a known volume of liquid to pass through the nonwoven that is in contact with an underlying dry standard absorbent pad.

This test method is intended for quality control and is designed for comparison of STT for different nonwoven coverstocks. It does not simulate in-use conditions for finished products.

### 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 186, *Paper and board — Sampling to determine average quality*

ISO 9073-6, *Textiles — Test methods for nonwovens — Part 6: Absorption*

### 3 Principle

Three subsequent doses of simulated urine are discharged at a prescribed rate, and under specified conditions, onto a test piece of nonwoven which is placed on a reference absorbent pad. The time taken for each of the liquid doses to penetrate the nonwoven is measured electronically, using conductometric detection. The absorbent pad remains unchanged and wet between the doses.

### 4 Material and reagents

**4.1 Absorbent pad**, consisting of ten plies of filter paper (size: 100 mm × 100 mm) with the test side upwards, as specified by the supplier.

The mean STT, in 10 replicate determinations without the nonwoven, shall be within  $(1,7 \pm 0,3)$  s.

The liquid absorption capacity, of the paper, as determined by ISO 9073-6, shall be 480 % minimum.

**4.2 Simulated urine**, consisting of a 9,0 g/l solution of analytical grade sodium chloride in deionized water with a surface tension of  $(70 \pm 2)$  mN/m at  $(23 \pm 2)$  °C.

This surface tension should be checked before each series of tests, as surface tension may change during storage.

## 5 Apparatus

**5.1 Burette**, 50 ml capacity, with supporting stand, or 5 ml pipette.

**5.2 Liquid dispenser with conductometric endpoint detection of liquid absorption** that consists of the following parts:

**5.2.1 Funnel**, fitted with a magnetic exit valve, giving a rate of discharge of 25 ml in  $(3,5 \pm 0,25)$  s.

**5.2.2 Ring stand**, to support the funnel.

**5.2.3 Electronic conductivity detector**, capable of detecting saline solution with 0,05 s response time. Fits with strike-through plate (5.2.4).

**5.2.4 Strike-through plate** (see Figures 1 and 2), constructed of 25 mm thick transparent acrylic sheet, of total mass  $(500 \pm 5)$  g, fitted with corrosion-resistant electrodes consisting of 1,6 mm diameter platinum or stainless steel wire.

The electrodes shall be positioned as shown in Figures 1 and 2.

The plate surface, electrode surface and the star-shaped orifice shall be clean and free from deposits and particulate matter. Clean regularly, e.g. with a mildly abrasive car polish and a dry cloth, and/or hot water.

**5.2.5 Baseplate**, of transparent acrylic sheet, approximately 125 mm × 125 mm square and 5 mm thick.

**5.2.6 Electronic timer**, for measuring the STT, accurate to 0,01 s.

The timer is connected with the conductivity detector (5.2.3) such that as conductive liquid closes/opens the contact between the electrodes, the timer starts/stops.

**5.3 Stopwatch**, capable of measuring 60 s to an accuracy of 1 s.

## 6 Procedure

**6.1** Set up the ring stand holding the funnel. Make sure that the timer and conductivity detector are switched on, and the electrodes are connected.

**6.2** Cut a nonwoven test piece, 125 mm × 125 mm, selected in accordance with ISO 186, if applicable.

**6.3** Prepare 1 set of 10 plies of filter paper, stacking the paper plies on top of each other, test side upwards.

**6.4** Place the nonwoven test piece on top of the set of 10 plies of filter paper that are placed on the baseplate of the instrument. Position the nonwoven such that the direction of liquid flow during the test corresponds with the intended use of the nonwoven.

For example, for personal hygiene products, the side of the nonwoven that is intended to be in contact with the user's skin shall be facing upwards.

**6.5** Place the strike-through plate on top of the nonwoven with the centre of the plate approximately over the centre of the test piece. Centre the funnel over the orifice in the plate. Where available, for the Lister instrument <sup>1)</sup>, this corresponds with the position defined by the designated positioning template.

**6.6** Adjust the height of the funnel such that the dispensing tip is  $(45 \pm 1)$  mm above the top of the instrument baseplate. For Lister equipment, this corresponds to the minimum position of the test head, as defined by the vertical positioning ring.

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1) Lister is an example of a suitable product available commercially. This information is given for the convenience of users of this part of ISO 9073 and does not constitute an endorsement by ISO of this product.



- 6.7** Check whether the timer display shows zero. If not, re-set.
- 6.8** Dispense with the pipette or burette, 5,0 ml of test liquid (4.2) into the funnel, while keeping the discharge valve of the funnel closed.
- 6.9** Open the magnetic discharge valve of the funnel to discharge the 5,0 ml of liquid. The initial flow of liquid will complete the electrical circuit and start the electronic timer.
- The timer will stop when the liquid has penetrated into the nonwoven and dropped below the level of the electrodes in the strike-through plate. At that time, start the stopwatch.
- 6.10** Record the time indicated by the electronic timer (STT-1).
- 6.11** Wait for a time period of 60 s (stopwatch). In this period, dispense a fresh aliquot of 5,0 ml of test liquid (4.2) into the funnel.
- 6.12** As the stopwatch reads 60 s, repeat steps 6.9 to 6.11 for measuring the STT of the second dose (STT-2).
- 6.13** As the stopwatch reads 60 s, repeat steps 6.9 and 6.10 for measuring the STT of the third dose (STT-3).
- 6.14** Clean and dry the bottom of the electrode plate with a dry tissue before testing the next piece of nonwoven.
- 6.15** Repeat the test procedure for the required number of test pieces.
- 6.16** Before storage, rinse with deionized water and dry the bottom of the electrode plate with a dry tissue.

NOTE Occasionally, the conductivity detector may not detect an endpoint, or the STT comes out exceedingly long ( $> 5 \times$  the intra-lab standard deviations away from the average), and well after the visually detected endpoint. In that case, discard the result.

Upon recurrence, clean the electrode as indicated under 5.2.4.

## 7 Test report

The test report shall include the following information:

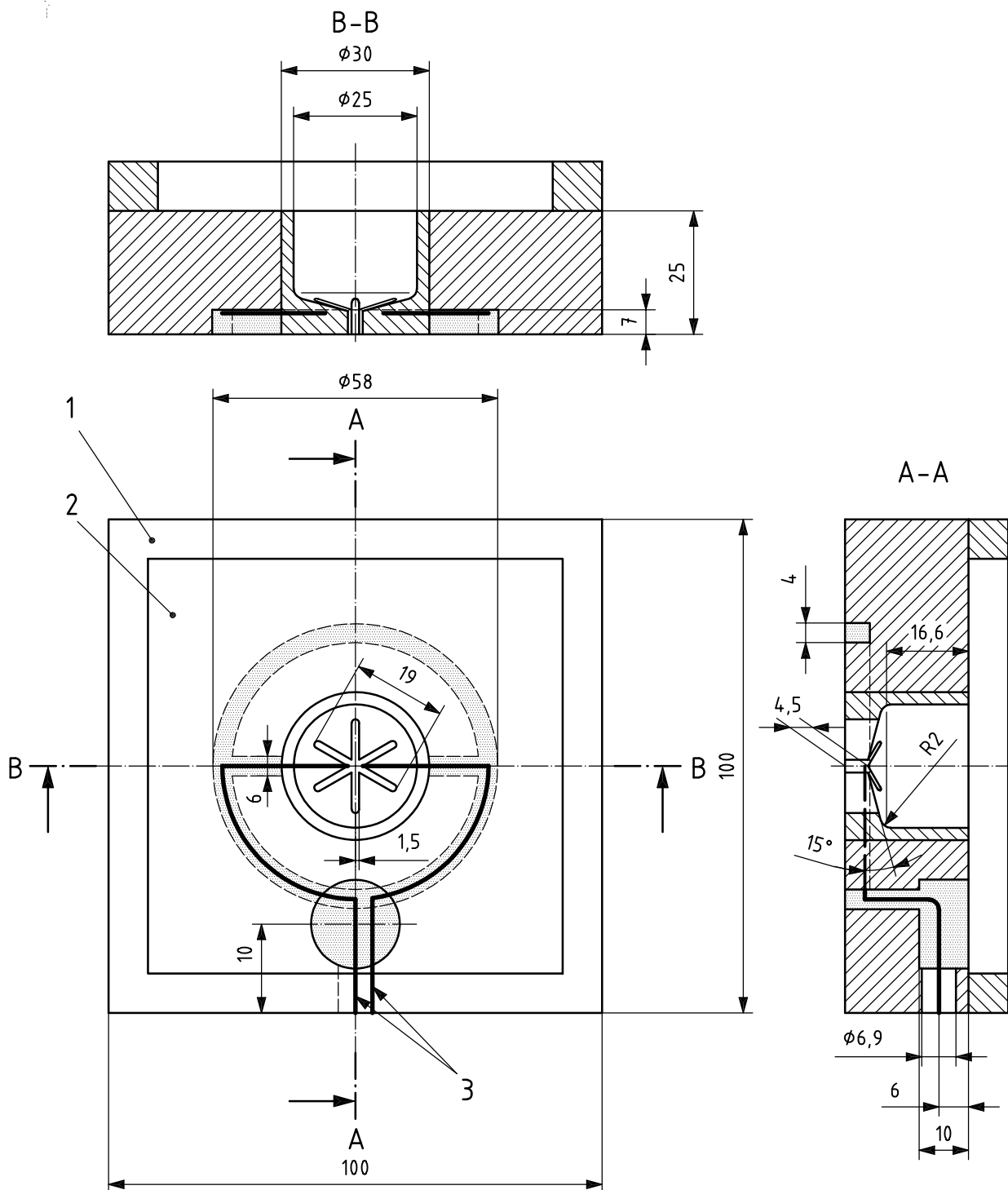
- a) complete identification of the nonwoven material;
- b) surface tension of simulated urine, if different from the value specified in 4.2;
- c) testing conditions;
- d) individual STT for each of the doses (STT-1, STT-2 and STT-3), to an accuracy of 0,1 s;
- e) calculate the average and standard deviation for all of the STT-1, respectively STT-2 and STT-3, for replicate test pieces from the same material portion/lot, if required;
- f) any deviation from the procedure described in this part of ISO 9073.

## 8 Precision

The data for the repeatability and reproducibility of this test method were established by inter-laboratory tests carried out in 2000 by EDANA <sup>2)</sup> and are given in Annex A. The evaluation of the laboratory tests was carried out according to ISO 5725-2.

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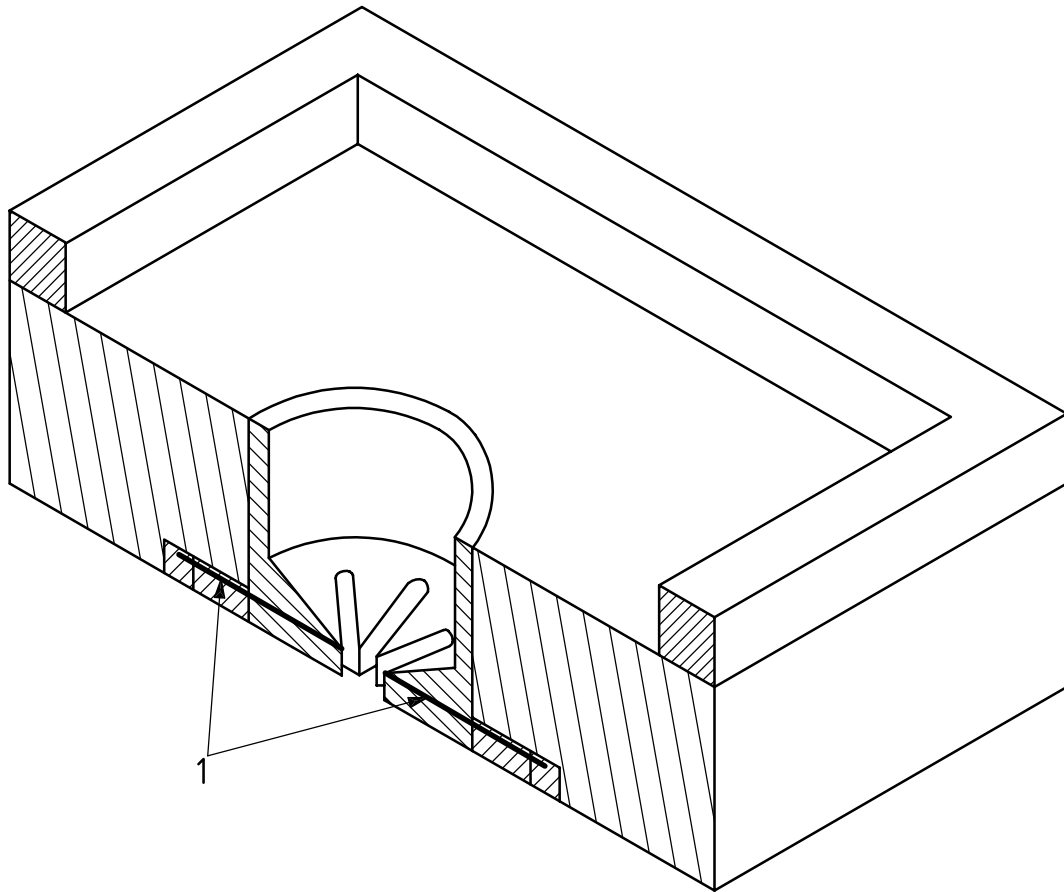
2) EDANA: European Disposables and Nonwovens Association.



**Key**

- 1 optional weighing strips
- 2 strike-through plate (transparent acrylic sheet)
- 3 electrodes (1,6 mm in diameter)

**Figure 1 — Strike-through plate**



**Key**

- 1 wire electrodes (1,6 mm in diameter)

**Figure 2 — Section across strike-through plate on centreline of 25 mm diameter cavity**

## Annex A (informative)

### Precision

Figures for the repeatability and reproducibility of this method are the results of collaborative studies carried out in 2000 by EDANA, with the following data:

	SAMPLE A <sup>a</sup>			SAMPLE B <sup>b</sup>			SAMPLE C <sup>c</sup>		
	1st dose	2nd dose	3rd dose	1st dose	2nd dose	3rd dose	1st dose	2nd dose	3rd dose
Number of participating laboratories	7	7	7	7	7	7	7	7	7
Number of non-eliminated laboratories	6	6	6	6	6	6	7	7	7
Number of single values of the non-eliminated laboratories	60	60	60	59	60	59	70	70	68
Average STT (seconds)	1,48	2,59	2,83	1,41	2,73	7,25	2,07	4,82	6,49
Standard deviation of repeatability, $s_r$	0,17	0,14	0,80	0,23	0,28	2,91	0,36	1,55	2,15
Coefficient of repeatability, $CV_r$	11,5 %	5,4 %	28,3 %	16,1 %	10,4 %	40,2 %	17,4 %	32,3 %	33,0 %
Repeatability limit, $r (2,8 \times s_r)$	0,48	0,39	2,24	0,63	0,79	8,16	1,00	4,35	6,01
Standard deviation of reproducibility, $s_R$	0,33	0,31	0,84	0,37	0,44	3,93	0,43	1,91	2,64
Coefficient of reproducibility, $CV_R$	22,5 %	12,2 %	29,7 %	26,4 %	16,0 %	54,2 %	20,9 %	39,7 %	40,6 %
Reproducibility limit, $R (2,8 \times s_R)$	0,93	0,88	2,35	1,04	1,22	11,00	1,21	5,36	7,39
<sup>a</sup> Sample A: non-durable hydrophilic carded nonwoven. <sup>b</sup> Sample B: durable hydrophilic carded nonwoven. <sup>c</sup> Sample C: durable hydrophilic spunlaid nonwoven.									

## Bibliography

- [1] ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*
- [2] ISO 9073-8, *Textiles — Test methods for nonwovens — Part 8: Determination of liquid strike-through time (simulated urine)*

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