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**Nonwovens — Test methods —**

**Part 14:**

**Coverstock wetback (simulated urine)**

*Nontissés — Méthodes d'essai —*

*Partie 14: Remouillage de l'enveloppe (urine artificielle)*

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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.

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 document 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 38 *Textiles*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 248, *Textiles and textile products*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 9073-14:2006), which has been technically revised.

The main changes are as follows:

- the title has been changed from "*Textiles — Test methods for nonwovens — Part 14: Coverstock wetback*" to "*Nonwovens — Test methods — Part 14: Coverstock wetback (simulated urine)*";
- descriptions in [5.1](#), [5.2](#) and [5.3](#) have been improved;
- procedure description in [9.3](#) has been changed;
- report items have been updated and blotter paper identification has been added.

A list of all parts in the ISO 9073 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Nonwovens — Test methods —

## Part 14: Coverstock wetback (simulated urine)

### 1 Scope

This document specifies a test method for the determination of the ability of diaper coverstock to resist the transport back onto the skin of a liquid which has already penetrated the coverstock.

This test corresponds with repeated liquid strike-through time according to NWSP 070.7.

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

### 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 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3951-1, *Sampling procedures for inspection by variables — Part 1: Specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection for a single quality characteristic and a single AQL*

ISO 9092, *Nonwovens — Vocabulary*

ISO 9073-13, *Nonwovens — Test methods — Part 13: Repeated liquid strike-through time (simulated urine)*

ISO 11224, *Textiles — Web formation and bonding in nonwovens — Vocabulary*

ASTM D3574, *Standard test method for flexible cellular materials, slab, bonded and moulded urethane foams.*

NWSP 005.0, *Nonwoven sampling*

NWSP 10.1, *Methods for Nonwoven Absorption*

NWSP 70.7, *Repeated Liquid Strike-Through Time (Simulated Urine)*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9092, ISO 11224 and the following 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 <https://www.electropedia.org/>

### 3.1

#### **sample**

product or portion of a product taken from a production lot for testing purposes, identifiable and traceable back to the origin

### 3.2

#### **simulated urine**

testing liquid consisting of a 9 g/l solution of sodium chloride in demineralized water with a surface tension of  $(70 \pm 2)$  mN/m

### 3.3

#### **test specimen**

specific portion of the identified sample upon which a test is performed, many specimens sometimes being tested from the same sample, using different locations

### 3.4

#### **strike-through time**

##### **STT**

time taken for a known volume of liquid to pass through the nonwoven that is in contact with an underlying dry standard absorbent pad

## 4 Principle

A test specimen of coverstock is placed over a standard absorbent medium (ply of blotter paper) which is then loaded three times according to the repeated STT, in accordance with ISO 9073-13, with a specific quantity of simulated urine. After the third dose a simulated baby weight (SBW) is placed onto the coverstock and absorbent medium to ensure even spreading of the liquid.

A pre-weighed pick-up paper is then placed on the coverstock and the weight (SBW) again put on top.

The mass of liquid absorbed by the pickup paper is defined as wetback.

## 5 Reagents and materials

Use reagents of recognized analytical grade, unless otherwise specified, and demineralized water.

**5.1 Absorbent pad (blotter paper)**, consists of 7 layers of blotter paper (100 mm × 100 mm) with the smooth side up.

The blotter paper shall meet the following specifications.

- The mass per unit area of paper shall be  $(139 \pm 11)$  g/m<sup>2</sup>.
- The liquid absorption capacity, of the paper, as determined by NWSP 010.1, shall be at least 480 %.
- The mean first strike-through time shall be 2 s or less, using test procedure NWSP 070.7, but without a test sample.

**NOTE** Information concerning a potential source of suitable blotter paper can be obtained from the nonwovens industry associations, see References [6] and [7].

**5.2 Simulated urine**, consisting of a 9 g/l solution of sodium chloride in 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 it can alter during storage.

**5.3 Pick-up (blotter) paper**, with dimensions 125 mm × 125 mm, needs to meet the same specifications as the absorbent pad, see [5.1](#).

**5.4 Grade 3 water**, according to ISO 3696.

## 6 Apparatus

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

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

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

**6.4 Strike-through plate**, see [Figures C.1](#) and [C.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 set in grooves of cross-section  $4,0 \text{ mm} \times 7,0 \text{ mm}$  cut in the base of the plate and fixed with quick-setting epoxy resin.

- a) The electrodes shall be positioned as shown in [Figures C.1](#) and [C.2](#) in [Annex C](#).
- b) Base plate, of transparent acrylic sheet, approximately  $125 \text{ mm} \times 125 \text{ mm}$  square and the thickness about 5 mm.

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

**6.5 Electronic timer**, measuring to the nearest 0,01 s.

**6.6 Simulated baby weight (SBW)**, consisting of as the following.

- a) A weight, stainless steel base  $10 \text{ cm} \times 10 \text{ cm}$  including a handle, of total mass  $(4\,000 \pm 20)$  g.
- b) A polyurethane foam rubber,  $10 \text{ cm} \times 10 \text{ cm}$  with a height of 2 cm, and its specifications as follows:
  - Density:  $25 \text{ kg/m}^3$  to  $75 \text{ kg/m}^3$  (in accordance with ASTM D3574, test A)
  - Hardness: 150 N to 250 N for 40 % compression and 5 cm sample (in accordance with ASTM D3574, test B)
- c) A polyethylene film 25  $\mu\text{m}$  thick.

Wrap the polyethylene film around the foam, securing the film in place with tape then taping the film and foam to the weight (see [Figure C.3](#) in [Annex C](#)).

NOTE More remarks can be found on [Annex B](#)

## 7 Conditioning

Bring samples to moisture equilibrium in the standard atmosphere for testing nonwovens as directed in ISO 139. Equilibrium is considered to have been reached when the increase in mass of the specimen in successive weighing made at intervals of not less than 2 h does not exceed 0,25 % of the mass of the specimen.

NOTE While conditioning for a fixed time cannot be accepted in cases of dispute, it can be sufficient in routine testing to expose the material to the standard atmosphere for testing textiles for a reasonable period of time before the specimens are tested, i.e. 4 h.

## 8 Sampling

### 8.1 General

Carry out sampling in accordance with ISO 186. Ensuring that the areas from which samples are taken, have no visible flaws and are not creased.

### 8.2 Lot size

A lot should be established based on a logical break in the process or as prescribed by a regulation or traceability requirements.

Test specimens shall be selected in accordance with NWSP 005.0, if applicable.

### 8.3 Sampling

If provided in the customer specification, take random sample as directed. If no requirements are provided, ISO 2859-1 or ISO 3951-1 shall be used. 3 samples should be taken for this test. In and of themselves, these are not valid sampling plans by default. An agreement between the purchaser and supplier requires taking into account process stability, producer's risk, consumer's risk, acceptable quality level and also the cost needs to be established.

In general, if the test characteristic can be considered normally distributed, the sampling procedures for inspection by variables will require fewer samples. However, small samples cannot reflect that normal distribution and the estimated percent defective can therefore be over or underestimated. In this case, as well as for attribute data, the sampling procedures for inspection by attributes should be used.

In the absence of any sampling size requirement, [Table 1](#) and [Table 2](#) can be used. Switching rules are required to maintain the AQL protection.

**Table 1 — Attributes (1.0 AQL, General Inspection Level II)**

| Number of units in the lot inclusive | Number of units that comprise the lot sample |
|--------------------------------------|----------------------------------------------|
| 1 to 150                             | 13                                           |
| 151 to 280                           | 32                                           |
| 281 to 500                           | 50                                           |
| 501 to 1 200                         | 80                                           |

**Table 2 — Variables ("s" method, General Inspection Level II)**

| Number of units in the lot inclusive | Number of units that comprise the lot sample |
|--------------------------------------|----------------------------------------------|
| 1 to 15                              | 3                                            |
| 16 to 25                             | 4                                            |
| 26 to 50                             | 6                                            |
| 51 to 90                             | 9                                            |
| 91 to 150                            | 13                                           |
| 151 to 280                           | 18                                           |
| 281 to 500                           | 25                                           |
| 501 to 1 200                         | 35                                           |

**NOTE** An adequate specification or other agreement between the purchaser and supplier requires taking into account the variability between rolls of nonwoven fabric and between specimens from a swatch from a roll of material to provide a sampling plan with meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

## 9 Procedure

This test shall be conducted in conjunction with the repeated strike-through test ISO 9073-13 as follows.

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

**9.2** Cut the nonwoven test specimen, to the size of 125 mm × 125 mm.

**9.3** Prepare the absorbent pad (see 5.1), stacking the paper layers on top of each other, smooth side upwards.

**9.4** Weigh the absorbent pad, place it with the smooth side upwards on the strike-through baseplate. The mass ( $W$ ) of the blotter paper pad will be used as a parameter to determine the total quantity of liquid ( $Q$ ) required for the wetback test.

- a) The quantity of liquid ( $Q$ ) will be calculated by multiplying  $W$  by the loading factor ( $LF$ ) of the blotter paper (see Annex B).
- b) Use the mean loading factor that is indicated on the technical datasheet. (for Ahlstrom grade 989 this is 3,60).

**9.5** Place the nonwoven test specimen on top of the absorbent pad. Position the nonwoven such that the direction of liquid flow during the test corresponds with the intended use of the nonwoven.

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

**9.6** Place the strike-through plate on top of the nonwoven. With the centre of the plate approximately over the centre of the test specimen. Centre the funnel over the orifice in the plate. If using a Lister<sup>1)</sup> instrument, this corresponds with the position defined by the designated positioning template.

**9.7** Adjust the height of the funnel, so 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 head, as defined by the vertical positioning ring.

**9.8** Check whether the timer display shows zero. Usually, the display shows the latest time and resets automatically. If not, re-set.

**9.9** Dispense with the pipette or burette, 5,0 ml of test liquid into the funnel, while keeping the discharge valve of the funnel closed.

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1) Lister AC is the trade name of a product supplied by Lenzing Instruments GmbH & Co. KG, Technologiepark 4, A-4851 Gampern, Austria This information is given for the convenience of users of this document 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 This company can also provide the calibration orifice.

**9.10** Open the magnetic discharge valve of the funnel, to discharge the 5,0 ml of liquid. The initial flow of liquid will complete the circuit and start the electronic timer.

The timer will stop when the liquid has penetrated the nonwoven and dropped below the level of the electrodes in the strike-through plate. At that time, start the stopwatch.

**9.11** Record the time indicated by the electronic timer (STT-1), to an accuracy of 0,01 s.

**9.12** Use the stopwatch to record a time interval of 60 s, during this period, dispense a fresh aliquot of 5,0 ml of test liquid into the funnel.

**9.13** As the stopwatch reads 60 s, repeat steps [9.9](#) to [9.11](#) for measuring the STT of the second dose (STT-2).

**9.14** As the stopwatch reads 60 s, repeat steps [9.9](#) to [9.11](#) for measuring the STT of the third dose (STT-3).

**9.15** Add additional quantity of test liquid, ( $AQ$ ) in order to reach the specified quantity ( $Q$ ). Calculate  $AQ$  according to [Formula \(1\)](#):

$$AQ = Q - 15 \quad (1)$$

where

$AQ$  is the additional quantity of the test liquid, in ml;

$Q$  is the quantity of liquid, in ml.

**9.16** Remove the baseplate with the sample and absorbent pad ([5.1](#)),

**9.17** Gently place the 4 kg weight assembly (SBW), onto the test specimen.

**9.18** The weight (SBW) remains in place for 3 min, to ensure even diffusion of the liquid.

**9.19** Remove the weight (SBW). Without disturbing the nonwoven test specimen.

**9.20** Weigh two layers of pick-up paper ([5.3](#)), to an accuracy of 0,001 g, record the mass ( $P_1$ ) and place them on the test specimen.

**9.21** Remove residual liquid by wiping the contact surface of the weight (SBW), with a dry tissue before gently replacing it over the pick-up paper. A loading speed should be applied in such a way that the last 5 cm displacement takes  $(5 \pm 1)$  s.

**9.22** The weight (SBW) remains in place for  $2 \text{ min} \pm 2 \text{ s}$ , during which time wetback has occurred.

**9.23** Remove the weight (SBW), Reweigh the pickup paper ( $P_2$ ), to an accuracy of 0,001 g.

**9.24** Repeat for the required number of test specimen, a minimum of 3 tests on test specimens from each sample is recommended. Measure the wetback according to steps [9.15](#) to [9.23](#).

If STT-3 is higher than 20 s, indicating non-durable treatment of the nonwoven, repeat the test with one dose only. After STT-1, add additional quantity of test liquid [see [Formula \(1\)](#)] and measure the wetback in accordance with [9.15](#) to [9.23](#).

## 10 Expression of results

Calculate the wetback value according to [Formula \(2\)](#):

$$WB = P_2 - P_1 \quad (2)$$

where

$P_2$  mass of two layers of pick-up paper after SBW is in place for 2 min, in g;

$P_1$  mass of two layers of pick-up paper, in g.

## 11 Precision

See [Annex A](#).

## 12 Test report

In addition to the precise test results, the report shall include the following information:

- a) a reference to this document, i.e. ISO 9073-14:2023;
- b) the manufacturer of the blotter paper and number of blotter paper layers used for the absorbent pad;
- c) number of the procedure approved for the execution of the test;
- d) complete identification of all materials tested and method of sampling;
- e) name and address of testing institution;
- f) make and model of testing equipment;
- g) date of the experiment;
- h) laboratory testing conditions, including the conditioning atmosphere used;
- i) surface tension of simulated urine, if different from the value specified;
- j) individual strike-through times (expressed in s), to an accuracy of 0,1 s;
- k) individual wetback (expressed in g) to an accuracy of 0,01 g;
- l) number of specimens tested and note CD and/or MD if significant;
- m) for computer processed data, identify the software used and the version;
- n) any deviation from the standard procedure;
- o) when calculated, the standard deviation or the coefficient of variation;
- p) whether or not samples were conditioned prior to testing and, if so, for how long;
- q) any unusual featured noted during the testing.

SI values are regarded as the official standard system of measurement for this standard procedure. If other systems of measurement are used in place of SI units (including inch-pound), their values shall be reported independently. Systems of measurement shall not be combined in any way, but shall be regarded and reported separately.

## Annex A (informative)

### Precision

#### A.1 General

Figures for the repeatability and reproducibility of this method are the results of collaborative studies carried out in 2000 by EDANA.

#### A.2 Samples

Sample A: non-durable hydrophilic carded nonwoven

Sample B: durable hydrophilic carded nonwoven

Sample C: durable hydrophilic spunlaid nonwoven

#### A.3 Test results

The test results are shown in [Table A.1](#).

**Table A.1 — Values for the repeatability and reproducibility**

|                                                         | SAMPLE A | SAMPLE B | SAMPLE C |
|---------------------------------------------------------|----------|----------|----------|
| No. of participating laboratories                       | 6        | 6        | 6        |
| No. of non-eliminated laboratories                      | 6        | 6        | 6        |
| No. of single values of the non-eliminated laboratories | 60       | 60       | 60       |
| Wetback measuring after                                 | STT-1    | STT-3    | STT-3    |
| Average (g)                                             | 0,13     | 0,13     | 0,17     |
| Standard deviation of repeatability, $s_r$              | 0,01     | 0,03     | 0,05     |
| Coefficient of repeatability, $CV_r$                    | 9,8 %    | 23,2 %   | 28,5 %   |
| Repeatability limit, $r$ ( $2,8 \times s_r$ )           | 0,04     | 0,09     | 0,14     |
| Standard deviation of reproducibility, $s_R$            | 0,02     | 0,04     | 0,06     |
| Coefficient of reproducibility, $CV_R$                  | 17,5 %   | 30,2 %   | 34,3 %   |
| Reproducibility limit, $R$ ( $2,8 \times s_R$ )         | 0,06     | 0,11     | 0,17     |

## Annex B (informative)

### Remarks

#### B.1 Loading factor (LF)

The loading factor is dependent on the liquid absorbency capacity (LAC) and will change as the LAC changes.

- a) A loading factor of 3,60 was found to be appropriate when using paper (blotter) filters of a LAC of least 480 %. It is recommended to use the loading factor provided by the manufacturer on the technical data sheet.
- b) A knowledge of the wetback vs. loading factor curve for a coverstock is useful sometimes, as close to the break point, wetback dispersion increases dramatically.
- c) The use of control nonwoven samples is strongly recommended to monitor the correct functioning of the test. Good wetback samples, one with wetback 0,12 g or less and the other around 0,20 g, are sufficient to monitor the test.

#### B.2 Other LAC of the filter (blotter) paper

Other LAC of the filter (blotter) paper used differs from the 480 % minimum or if a refined procedure is needed for research or for ranking purpose, different loading factors can be used. Modified LAC and LF should be mentioned in the report. It is recommended that the same filter paper batches are used for wetback comparison purpose.

NOTE If the LAC differs from the specifications, the filter paper supplier will indicate the recommended LF corresponding to this different LAC.

#### B.3 Application of the weight (SBW) in [9.17](#) and [9.23](#)

The application of the weight (SBW) in [9.17](#) and [9.23](#) is a critical step.

The training of the operator can be provided by practising the placement of the weight on a balance without overcharging the balance by more than a few grams (5 g).

Alternatively, an automatic system with a pneumatic piston can be used to apply the weight assembly consistently.

#### B.4 Maintenance

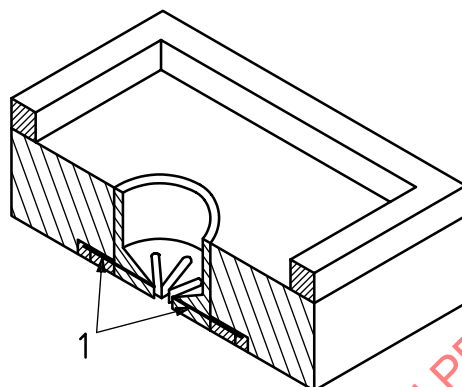
The repeatability of this test depends on the maintenance of the strike-through plate in order to avoid the formation of sodium chloride crystals, the creation of a water film or any other contamination on the walls that can modify the strike-through time measurement, see the maintenance instructions from the plate manufacturer.

## Annex C (informative)

### Detailed figures of strike-through tester apparatus

The different parts of strike-through tester are shown in [Figure C.1](#), [Figure C.2](#) and [Figure C.3](#).

Dimensions in millimetres



#### Key

- 1 wire electrodes  $\varnothing$  1,6 mm

**Figure C.1** — Section across strike-through plate on centre-line of 25 mm cavity