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Nonwovens — Test methods —

Part 13:
Repeated liquid strike-through time (simulated urine)

Nontissés — Méthodes d'essai —

Partie 13: Temps de transpercement successifs des liquides (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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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.

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 9073-13:2006), which has been technically revised.

The main changes are as follows:

— the title has been changed from "Textiles — Test methods for nonwovens — Part 13: Repeated liquid strike-through time" to "Nonwovens — Test methods — Part 13: Repeated liquid strike through time (simulated urine)";

— details of blotter paper pad in 5.1 (former 4.1) and 10.3 (former 6.1) have been changed;

— Clause 10 (former Clause 6, Procedure) has been changed;

— the test report items and addition of blotter paper identification (amount and manufacturer) have been updated;

— precision data in Annex A has been updated.

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.

Nonwovens — Test methods —

Part 13:
Repeated liquid strike-through time (simulated urine)

SAFETY WARNING — This document does not claim to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. It is expected that the person performing this test has been fully trained in all aspects of this procedure.

1 Scope

This document specifies a test method for the determination of the strike-through time (STT) for each of three subsequent doses of liquid (simulated urine) applied to the surface of a test specimen of nonwoven coverstock.

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

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

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

NWSP 010.1, *Three Standard Test Methods for Nonwoven Absorption*

NWSP 005.0, *Nonwoven sampling*

NWSP 070.7, *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 ± 2) mN/m

3.3
test specimen
specific portion of the identified sample upon which a test is performed, many test 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

Three subsequent doses of simulated urine are discharged at a prescribed rate, and under specified conditions, onto a test specimen 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.

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:

a) The mass per unit area of the paper is (139 ± 11) g/m^2.

b) The liquid absorption capacity, of the paper, as determined by NWSP 010.1 is at least of 480 %.

c) The mean first strike-through time is 2 s or less, using test procedure NWSP 70.7, but without a test specimen.

NOTE Information concerning a potential source of suitable blotter paper can be obtained from the nonwovens industry associations. See References [2] and [3].

5.2 Simulated urine, consisting of a 9 g/l solution of sodium chloride in water (5.3), with a surface tension of (70 ± 2) mN/m at (23 ± 2) °C. This surface tension should be checked before each series of tests, as it can alter during storage.

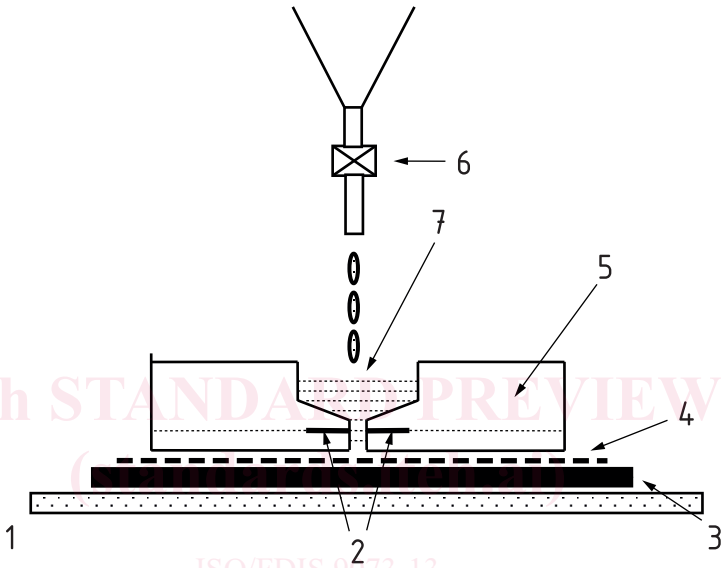
5.3 Grade 3 water, in accordance with ISO 3696.

6 Apparatus

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

6.2 Strike-through tester (see Figure 1)**,** designed such that it releases a standard aliquot of simulated urine into a cavity. Through a (star-shaped) opening in the bottom of the well that rests on the test piece, liquid drains through the test piece into an absorbent pad. The presence and disappearance of the test liquid in the well is detected conductometrically. The time required for the liquid to drain from the well is determined by an electronic timer that is connected to the conductometer.

NOTE More details of an example of apparatus can be found in the Annex B, Figure B.1 and Figure B.2.



Key

1 base plate
2 electrodes
3 absorbent
4 nonwoven
5 electrode plate
6 valve
7 saline solution

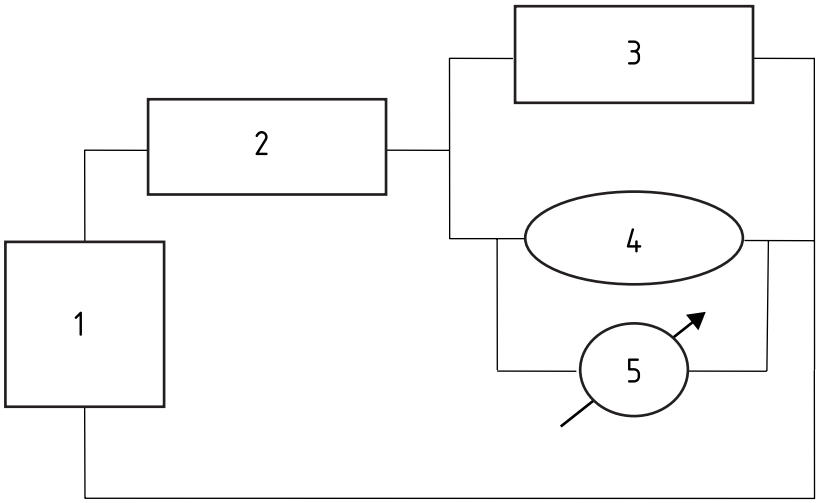
Figure 1 — Strike-through tester

The instrument consists of the following parts.

a) Funnel, fitted with a magnetic exit valve, capable of discharging 25 ml of saline solution in (3,5 ± 0,25) s.

b) Support for the funnel so the funnel position can be adjusted vertically. The distance between the funnel exit and the base plate shall be adjustable from 4,5 cm to at least 15 cm.

c) Electronic conductivity detector capable of detecting saline solution with 0,05 s response time. The detector should be connected with the electrodes in the strike-through plate 6.2 f). The principle of electrical wiring should be as indicated in Figure 2:



Key

1 voltage generator: 1 V, 300 Hz
2 programming resistance 100 kΩ
3 resistance 25 kΩ
4 strike-trough cell
5 voltage metre

Figure 2 — Electrical wiring

d) Typically, a threshold value is defined for V. Below the threshold value the cell condition is "conducting" which corresponds with presence of liquid. Above the threshold, the cell condition is "non-conducting", i.e. absence of liquid. A threshold value of 0,150 V has proven to be successful.

e) Equivalents are allowed. To be successful, the applied voltage shall alternate with a frequency of about 300 Hz, the cell current shall be about 10 µA and the voltage drop across the strike-through cell shall be steep enough when going from a "conducting" to a "non-conducting" condition, such that the disappearance from fluid from the cell can be detected with an accuracy of 0,05 s.

f) Electrode plate (see Figures B.1 and B.2) constructed of 25 mm thick transparent acrylic sheet of total mass (500 ± 5) g, fitted with corrosion-resistant electrodes consisting of 1,6 mm diameter platinum or stainless-steel wire.

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

h) The plate surface, electrode surface and the star-shaped cavity 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.

i) The voltage drop across the electrodes shall be (0,2 ± 0,01) V when the electrode compartment is empty and < 0,140 V when the compartment is filled with 0,9 % saline solution.

j) Baseplate made of transparent acrylic sheet, approximately 125 mm × 125 mm square and about 5 mm thick.

k) Electronic timer for measuring the STT, accurate to 0,01 s. The timer is connected with the conductivity detector [see 6.2 c)] such that as conductive liquid closes/opens the contact between the electrodes, the timer starts/stops.

6.3 Calibration orifice (see example in Figure B.3), gives a specified time for the passage of 10 ml of saline solution. The exact time shall be provided with the orifice with an accuracy of 0,01 s; an expected value is (2 ± 0,2) s. This is for verification of the correct operation of the test equipment.

The orifice shall fit leak-tight, (e.g. with an "O-ring) onto the electrode plate.

NOTE A suitable instrument, is provided under the name "Lister AC"[1)].

6.4 Stopwatch, capable of measuring 60 min with the accuracy of 1 s.

NOTE Depending on the model, a stopwatch might be incorporated in the Lister.

7 Conditioning

Bring samples to moisture equilibrium in the standard atmosphere for testing nonwovens as directed in ISO 139.

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. There shall be 3 test specimens for this test.

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. 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 may not 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.

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.

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 Instrument calibration verification

This check shall be carried out regularly for verifying correct operation of the instrument. The actual checking frequency can be derived from a control chart, as it depends on the type of products tested, and the likeliness of contamination of the electrode plate. In addition, it is done.

1) for new electrode plates,

2) when the instrument has not been used for a couple of days, and

3) after cleaning of the electrode plate.

The check intends to provide the operator an independent verification of instrument accuracy in case of unexpected or suspicious test results.

a) Place the electrode plate on top of the calibration orifice as indicated in Figure B.4 in Annex B. Then place the assembly on a suitable receiver, e.g., a Petri dish, such that liquid can run freely from the bottom of the orifice.

b) Make sure that the electronic timer and conductivity detector are switched on, and the electrode plate is connected to the detector.

c) Position the funnel such that the exit tube is 45 mm above the top of the orifice plate and over the middle of the electrode cavity.

d) Pipette 10 ml of simulated urine into the funnel, with the discharge valve closed.