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Textiles — Test methods for nonwovens —

Part 5: Determination of resistance to mechanical penetration (ball burst procedure)

Textiles — Méthodes d'essai pour nontissés —
Partie 5: Détermination de la résistance à la pénétration mécanique (méthode d'éclatement à la bille)

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Contents

Page

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 9073-5 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 5: Determination of resistance to mechanical penetration (ball burst procedure)*

— *Part 6: Absorption*

— *Part 7: Determination of bending length*

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

— *Part 9: Determination 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*

— *Part 15: Determination of air permeability*

— *Part 16: Determination of resistance to penetration by water (hydrostatic pressure)*

— *Part 17: Determination of water penetration (spray impact)*

— *Part 18: Determination of breaking strength and elongation of nonwoven materials using the grab tensile test*

Textiles — Test methods for nonwovens —

Part 5: Determination of resistance to mechanical penetration (ball burst procedure)

1 Scope

This part of ISO 9073 specifies a method for determining the resistance to mechanical penetration of nonwoven fabrics by a ball of a given diameter.

The method is primarily designed to be used on nonwovens with some degree of elasticity, for which a regular burst test is not applicable.

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*

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

ISO 10012:2003, *Measurement management systems — Requirements for measurement processes and measuring equipment*

3 Terms and definitions

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

3.1
nonwoven fabric
fabric made directly from a web of fibres, without the yarn preparation necessary for weaving and knitting

3.2
constant-rate-of-traverse (CRT) testing machine
testing machine in which the moving clamp moves at a uniform rate

3.3
bursting strength
force or pressure required to rupture a textile by distending it with a force, applied at right angles to the plane of the fabric, under specified conditions

3.4
elongation
distance the crosshead travels from the plane of the sample at the start of the test to the point of peak load

4 Principle

A specimen of nonwoven is securely clamped under tension between two grooved, ring-shaped plates secured horizontally in the position of the lower, fixed, clamp of a constant-rate-of-traverse (CRT) tensile-testing machine (see Figure 1). A force is exerted vertically downwards against the specimen by a polished hardened-steel ball that is attached in the position of the upper, movable, clamp. The test is terminated when the ball ruptures the material.

5 Apparatus

5.1 Constant-rate-of-traverse (CRT) tensile-testing machine, converted for use in the compression mode and fitted with a ball burst attachment (5.2) replacing the two clamp assemblies (see Figure 1).

5.2 Ball burst attachment, consisting of

a) a polished steel ball (5.3) that replaces the upper, moving, clamp of the tensile-testing machine;

b) a ring-clamp mechanism (5.4) that replaces the lower, fixed, clamp of the tensile-testing machine.

5.3 Polished steel ball, having a diameter of (25,400 ± 0,005) mm and spherical to within 0,005 mm.

The size of the ball may differ from that stated if so agreed upon by all interested parties and recorded in the test report.

5.4 Ring clamp, having an internal diameter of (44,500 ± 0,025) mm.

The size of the ring clamp may differ from that stated if so agreed upon by all interested parties and recorded in the test report.

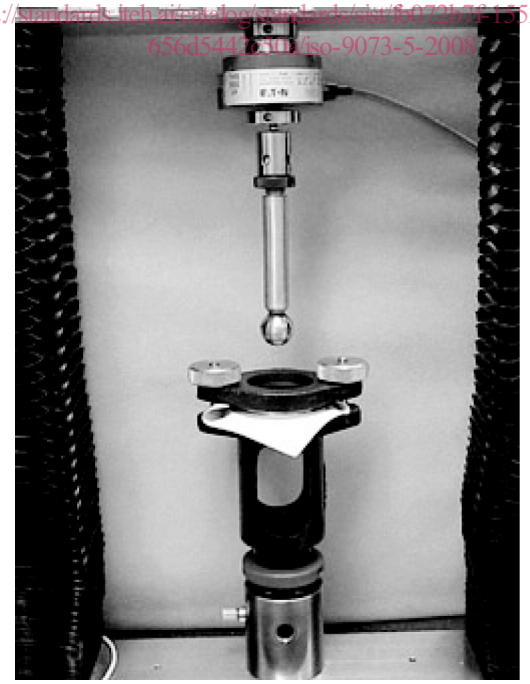

Figure 1 — Apparatus

6 Procedure

6.1 Specimens shall be selected in accordance with ISO 186. Bring the specimens from the prevailing atmosphere to moisture equilibrium for testing in the standard atmosphere as prescribed in ISO 139. If agreed upon by all parties, conditioning and testing may be carried out without preconditioning the test specimens.

Care in handling shall be observed so that test specimens do not contact any contaminants such as soap, salt, oil, etc., which might facilitate or hinder water penetration. No dirt or other foreign material shall be allowed on the specimen. Do not write on the test area of the specimen.

6.2 Each test specimen shall be at least 125 mm square or a circle at least 125 mm in diameter. Test specimens need not be cut for testing. Take no specimens nearer to the edge of the fabric than 300 mm.

6.3 Unless otherwise agreed upon and recorded in the test report, as when specified in an applicable material specification, take five test specimens from the laboratory sample(s) of fabric.

6.4 Metrological confirmation of the test apparatus shall be in compliance with Clause 7, Figure 2 and Annex A of ISO 10012:2003. Also take into account the following:

— Set-up procedures for machines from different manufacturers may vary. Prepare the machine and verify its calibration as directed in the manufacturer's instructions (see also Annex B).

— Set the distance for the travel of the ball so that it penetrates the test material but does not come in contact with the lower stage (very important).

— Set the testing machine for a crosshead speed of (300 ± 10) mm/min unless otherwise specified and agreed upon by all parties.

6.5 Verify the total operating system by testing specimens of a standard material for ball burst and comparing the data obtained with historical data from the same standard material. It is recommended that this verification of the system be carried out on a daily basis before use, but at a minimum it should be done weekly. In addition, the total operating system should be verified whenever there are changes in the load cells.

Select and prepare a standard material which has a ball burst strength in the range of interest.

Test the standard-material specimens in the same manner as unknown specimens (see 6.6).

Determine the bursting force for each standard-material specimen, the mean value and the standard deviation from the mean.

Compare the new data with previous data for the same material. If any of the data values are outside the tolerances established, recheck the total system to locate the cause for the deviation. Do not start testing until the results of standard-material testing are within these tolerances.

6.6 Place a specimen under tension in the ring clamp and fasten it securely by means of the screws or pneumatic mechanism. Start the CRT machine, using a downward crosshead speed of (300 ± 10) mm/min and continue at that speed until the specimen bursts. Record, to the nearest 5 N, the ball burst strength of the specimen.

6.7 Ignore any failure that is confined to the edge of the clamp and repeat the test on another test specimen. Ignore any test result where the test specimen slips in the clamp and repeat the test on another test specimen.

NOTE Slippage is normally evident as blurring of the marks left by the ring clamp on the test specimen.