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Textiles — Test methods for nonwovens —

Part 15: Determination of air permeability

Textiles — Methodes d'essai pour nontissés —

Partie 15: Détermination de la perméabilité à l'air

Reference number
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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 9073-15 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*

— *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 15: Determination of air permeability

1 Scope

This part of ISO 9073 specifies a method of measuring the flow of air passing perpendicularly through a given area of a fabric.

This test method applies to most nonwovens, such as laminates, which are treated or untreated. They may have either a low- or high-basis weight.

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/or 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
air permeability
velocity of an air flow passing perpendicularly through a test specimen under a prescribed air pressure differential over a certain time period

NOTE Air permeability is expressed in litres per square centimetre per second ($l/cm^2 \cdot s$), or any other equivalent unit.

4 Principle

The flow of air passing perpendicularly through a given area of fabric is measured at a given pressure difference across the fabric test area over a given period of time.

5 Apparatus

5.1 **Test head**, which provides a circular test area of either 20 cm^2, 38,3 cm^2 or 50 cm^2. The tolerance on the test heads or test areas shall not exceed 0,5 %.

5.2 **Clamping system**, to secure test specimens, capable of holding the specimen tight enough to the test head without distortion, and ensuring the absence of edge leakage beneath the test specimen.

5.3 **Vacuum pump**, for drawing a steady flow of air perpendicularly through the test area and for adjusting the airflow rate that preferably provides pressure differentials of between 100 Pa and 2 500 Pa (10 mm and 250 mm of water) between the two surfaces of the specimen. The test apparatus should be capable of providing a pressure drop of either 100 Pa, 125 Pa or 200 Pa across the specimen.

5.4 **Pressure sensors** or **manometer**, connected to the test head underneath the test specimen, to measure the pressure drop across the test specimen in pascals or millimetres of water with an accuracy of $\pm$ 2 %.

5.5 **Flowmeter** or **variable orifice**, which can measure air velocity through the test area, in $l/cm^2 \cdot s$ or other equivalent units of measure. The tolerance shall not exceed $\pm$ 2 %. Whatever unit of measure is used, it should be agreed upon by all parties and included in the test report.

5.6 **Calibration plate**, or other means, made of durable material with a known preset air permeability number at the specified test pressure differential to verify the test equipment.

5.7 **Means of calculating and displaying the required results**.

5.8 **Cutting dies** or **templates**, to cut specimens to dimensions of 100 mm by 100 mm. Some types of equipment are constructed to allow testing of large pieces of nonwovens.

6 Procedure

6.1 Sample in accordance with ISO 186 and, unless otherwise specified, use 5 as the minimum specimen size.

6.2 Bring the specimens from the prevailing atmosphere to moisture equilibrium for testing in the standard atmosphere, as specified in ISO 139.

6.3 Cut five square specimens of 100 mm by 100 mm, if the apparatus is unable to handle large specimens.

6.4 Handle the test specimens carefully at the edges, to avoid changing the natural state of the test area of the nonwoven material.

6.5 Metrological confirmation of the test apparatus shall be in compliance with Clause 7, Figure 2 and Annex A of ISO 10012:2003. This instrument should be able to be calibrated and supplied with a fact sheet indicating that it meets ISO certification. This calibration certificate should be maintained in accordance with the manufacturer's specifications.

6.6 Place each test specimen on the test head of the test instrument, and seal the ring with adequate tension to prevent distortion or side leakage while the test is being performed.

6.7 Place coated test specimens with the coated side down (towards the low-pressure side) to minimize edge leakage.

6.8 Start the suction device.

6.9 Regulate the flow of air until the desired pressure drop, 100 Pa, 125 Pa or 200 Pa, is attained. On some of the newer machines, the test pressure is digitally preselected in accordance with the test standard, and the pressure drop across the variable orifice is digitally displayed in the selected unit of measurements for a direct reading.

6.10 If a manometer is used, wait until the desired depression has stabilized. Then read on the graduated scale the air permeability, expressed in litres per square centimetre per second ($l/cm^2 \cdot s$). These measurement units can be converted to other compatible units that are agreeable to all parties. When handling fabrics that are very open or very dense, another pressure differential, other than the standard, may be required. This alternative pressure differential should be reported.

7 Calculation

Calculate the arithmetic mean of individual readings directly from the test instrument, and calculate the coefficient of variation to the nearest 0,1 %. Relate the readings to the area of the test head. The airflow should be expressed in litres per square centimetre per second ($l/cm^2 \cdot s$) or any equivalent unit.

The individual specimen's readings should be rounded to three significant digits.

If there are questions relating to different testing apparatuses and how to arrive at their calculations, follow the manufacturer's instructions, as applicable.

NOTE For air permeability results obtained above 2 000 m above sea level, a correction factor may be required if the testing apparatus does not make these corrections.

8 Test report

The test report shall include all information needed to duplicate the test procedure and its results, in particular:

— arithmetic mean of individual readings;

— coefficient of variation;

— type or designation of material tested;

— number of test pieces tested;

— testing conditions;

— testing surface area used;

— pressure drop used;

— any deviation from the standard procedure;

— a reference to this part of ISO 9073 (ISO 9073-15:2007).

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