INTERNATIONAL STANDARD

ISO 9073-3

First edition
1989-07-01

Textiles — Test methods for nonwovens —

Part 3:
Determination of tensile strength and elongation

Textiles — Méthodes d'essai pour nontissés —

Partie 3: Détermination de la résistance à la traction et de l'allongement

Reference number
ISO 9073-3 : 1989 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9073-3 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*

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

Introduction

Although nonwovens are classified within the textile industry, it should be recognized that nonwovens technologically share characteristics not only with textile products but also with paper and/or plastic products. There is an existing international textile test, ISO 5081. However, in order to meet the specific needs of nonwovens, alternative requirements to those listed in ISO 5081 are specified in this part of ISO 9073. These are

a) a different sampling procedure;

b) a constant rate of extension, i.e. 100 mm/min.

This page intentionally left blank

Textiles — Test methods for nonwovens —

Part 3:
Determination of tensile strength and elongation

1 Scope

This part of ISO 9073 specifies a method for the determination of the tensile properties of nonwovens by the cut strip method.

NOTE — Anomalies can occur when testing some spun-laid and glass fibre nonwovens. This may require modification of the test procedure.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9073. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9073 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 139 : 1973, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 186 : 1985, *Paper and board — Sampling to determine average quality.*

ISO 5081 : 1977, *Textiles — Woven fabrics — Determination of breaking strength and elongation (Strip method).*

3 Principle

Application of a force longitudinally to a test piece of a specified length and width at a constant rate of extension.

Determination of values for breaking strength and elongation from the recorded force-elongation curve.

4 Apparatus

4.1 Tensile testing machine, constant rate of extension type, equipped with an autographic recorder to register applied force and clamp separation.

4.2 Clamps, with jaws capable of holding the test pieces securely across their full width without damage.

5 Sampling

Carry out sampling in accordance with ISO 186, where possible taking test specimens of an approximate length at 1 m from the full width of the material. Ensure that the areas from which the specimens are taken have no visible flaws and are not creased.

NOTE — This method of sampling recognizes and makes provisions for "anisotropy" (differences in properties along various directions, principally machine and cross direction) in the final specimens. However, these specimens are random representatives of the material and in some cases it may be desirable to investigate systematic variations of properties (including anisotropy), for example across the width, or in certain positions along the length of a given reel. In all such cases, special provisions should be agreed between purchaser and vendor and recorded in the test report. A procedure for more detailed examination of variability within a given batch of material is available in TAPPI T 11-05-74 and may be found helpful. This publication may be obtained from: The Technical Association of Pulp and Paper Industries, 1 Dunwoody Park, Atlanta, Georgia 30338, USA.

6 Preparation and conditioning of test pieces

6.1 Unless otherwise specified, cut five test pieces in the machine direction and five in the cross-machine direction, ensuring that they are all taken at least 100 mm from the edge and are equally distributed across the width and length of the specimen.

6.2 Cut the test pieces 50 mm ± 0,5 mm wide and of sufficient length to allow a jaw separation of 200 mm, thus avoiding risks due to local heterogeneity of nonwovens or to undue cutting of long-fibre nonwovens.

NOTE — Wider test pieces and different forms of clamping, e.g. C-form or piped form, may be used by agreement between the interested parties; a note of these special conditions should be included in the test report.

6.3 Condition the test pieces as specified in ISO 139.

6.4 If wet tensile tests are required, soak the test pieces, without conditioning, for at least 1 h in a solution containing

1 g of a non-ionic wetting agent per litre of distilled water. Remove a test piece, shake off excess water, and test immediately. Repeat the operation for each of the other nine test pieces.

NOTE — A wetting time of less than 1 h may be used by agreement between the interested parties; if so, it should be noted in the test report.

7 Procedure

7.1 Carry out the testing in the standard atmosphere for testing (see ISO 139).

7.2 Set the jaws of the tensile testing machine 200 mm ± 1 mm apart and clamp the test piece between them; straighten out the test piece until the force curve is on the zero line.

NOTES

1 Pretensioning may be applied as described in ISO 5081; if so, it should be noted in the test report.

2 Where 200 mm is not available, a shorter test piece may be tested by agreement between the interested parties; if so, this should be noted in the test report.

7.3 Apply a constant rate of extension of 100 mm/min and record the force-elongation curve for each test piece.

NOTE — Other rates of extension may be desirable and should be agreed between the interested parties; if so, they should be noted in the test report.

8 Expression of results

8.1 Use the force-elongation curve to determine the maximum breaking strength in newtons. If several peak values for the breaking strength occur during the test, take the highest value as the maximum breaking strength, and note this occurrence in the test report.

8.2 Determine the elongation of the test piece at the maximum breaking strength and express this as a percentage of the nominal gauge length, that is, the original jaw separation.

8.3 Discard the results from any test piece where the break occurs in the clamp or where any break reaches the jaws at a minimum of one point.

8.4 Determine the means of the results, expressing the average breaking strength, in newtons, to the nearest 0,1 N, and the average percentage elongation at break to the nearest 0,5 %. Calculate the coefficients of variation of the results.

NOTE — Rupture energy may also be calculated from the total area under the curve.

9 Test report

The test report shall include the following information:

a) a reference to this part of ISO 9073;

b) all details necessary for the identification of the material;

c) the results of the test in both the machine direction and cross direction (see 8.4);

d) the conditioning atmosphere used;

e) any unusual features noted during the testing, or deviations from the standard procedure.

This page intentionally left blank

UDC 677.076.4 : 677.017.42 : 620.172

Descriptors : textiles, fabrics, nonwoven fabrics, tests, tension tests.

Price based on 2 pages