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Nonwovens -— Test methods

— Part 3

Determination of tensile strength and elongation at break using the strip method

Contents

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 9073-3:1989), which has been technically revised.

The main changes ~~compared to the previous edition~~ are as follows:

~~— the title has been changed;~~

— the title has been changed from "Textiles — Test methods for nonwovens — Part 3: Determination of tensile strength and elongation" to "Nonwovens — Test methods — Part 3 Determination of tensile strength and elongation at break using the strip method";

— the mandatory Terms and definitions clause (Clause 3) has been added and subsequent clauses have been renumbered;

~~— Textual review~~

— 8.2 has been revised.

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 — Part3: Determination of tensile strength and elongation at break using the strip method

SAFETY WARNING — This document does not claim to address all 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 breaking force and elongation of nonwovens using a strip method in conditioned or wet state. This test method describes two procedures, Option A (width of test specimen: 25- mm) and Option B (width of test specimen: 50- mm).

This document specifies methods using constant rate of specimen extension (CRE) tensile testers. ~~and constant~~Constant rate of loading (CRL) instruments is covered, for information, in ISO 2062:2009, Annex A, in recognition of the fact that these instruments are still in use and can be used by agreement.

~~The mechanism of the two types of tensile tester (CRE and CRL) is different (like, machine operational design, Tolerance of "indicated force and Record elongation", verification of indicated force and verification of recorded clamp displacement, "see ASTM D76") and their results are not comparable. In the most International Standards consider only the CRE tester (see ISO 13934, ISO 1421).~~

~~If it is necessary to describe CRE machines, these alternative methods shall be described for information in Annex (see ISO 2062) with title: "Alternative methods using constant rate of loading (CRL) testers".~~

~~5~~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 3696, *Water for analytical laboratory use — Specification and test methods*

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

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

ISO 7500-1, *Metallic materials — ~~Verification~~Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — ~~Verification~~Calibration and ~~calibration~~verification of the force-measuring system*

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

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

~~8~~3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
breaking force
maximum force (3.~~1~~2) applied to a material carried to rupture

3.2
maximum force
maximum force appearing during a *test specimen* (3.11) carried to rupture in a tensile test under the specified conditions

3.3
force at rupture
force recorded at the point of rupture of a *test specimen* (3.11) during a tensile test

Note 1 to entry: See Figure 1.

3.4
constant-rate-of-extension tensile testing machine
CRE tensile testing machine
tensile-testing machine provided with one clamp which is stationary and another clamp which moves with constant speed throughout the test, the entire testing system being virtually free from deflection

3.5
constant-rate-of-load tensile testing machine
CRL tensile testing machine
testing machine in which the rate of increase of the load being applied to the specimen is uniform with time after the first 3 seconds

3.6
~~**cut strip test**~~
~~strip test in which the specimen is cut to the specified testing width, i.e. 25 or 50 mm wide~~

~~3.7~~
elongation
ratio of the *extension* (3.9) of a *test specimen* (3.11) to its *initial length* (3.15)

Note 1 to entry: Elongation is expressed as a percentage

3.~~8~~7
elongation at maximum force
elongation (3.6) of a *test specimen* (3.11) produced by the *maximum force* (3.2)

Note 1 to entry: See Figure 1.

3.~~9~~8
elongation at rupture
elongation (3.6) of a *test specimen* (3.11) corresponding to the *force at rupture* (3.3)

Note 1 to entry: See Figure 1.

3.~~10~~9
extension
increase in length of a *test specimen* (3.11) produced by a force, in this context, stretching

3.~~11~~10
sample
product or portion of a product taken from a production lot for testing purposes, identifiable and traceable back to the origin

3.~~12~~11
test specimen
test specimen specific portion of the identified *sample* (3.10) upon which a test is performed, many specimens sometimes being tested from the same sample, using different locations

3.~~13~~12
strip test
tensile test in which the full width of the *test specimen* (3.11) is gripped in the jaws of the testing machine

3.~~14~~13
tensile strength
resistance of a material to breaking under tension

Note 1 to entry: See Figure 1.

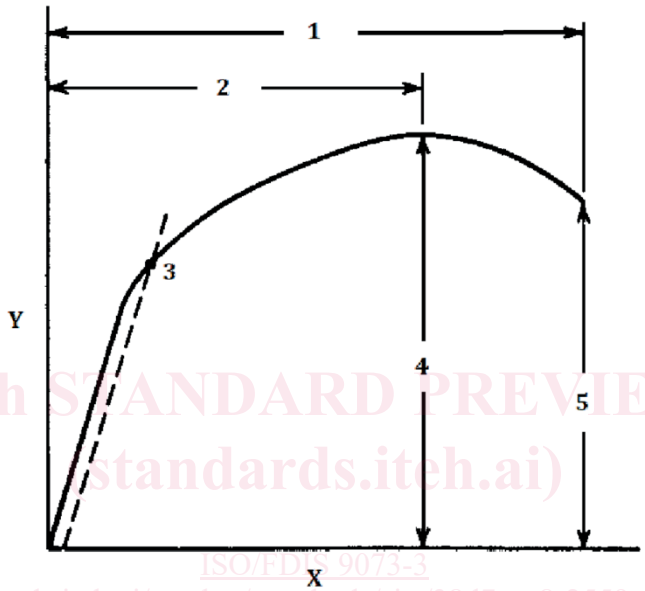
Note 2 to entry: Tensile strength is preferably expressed in Newton.

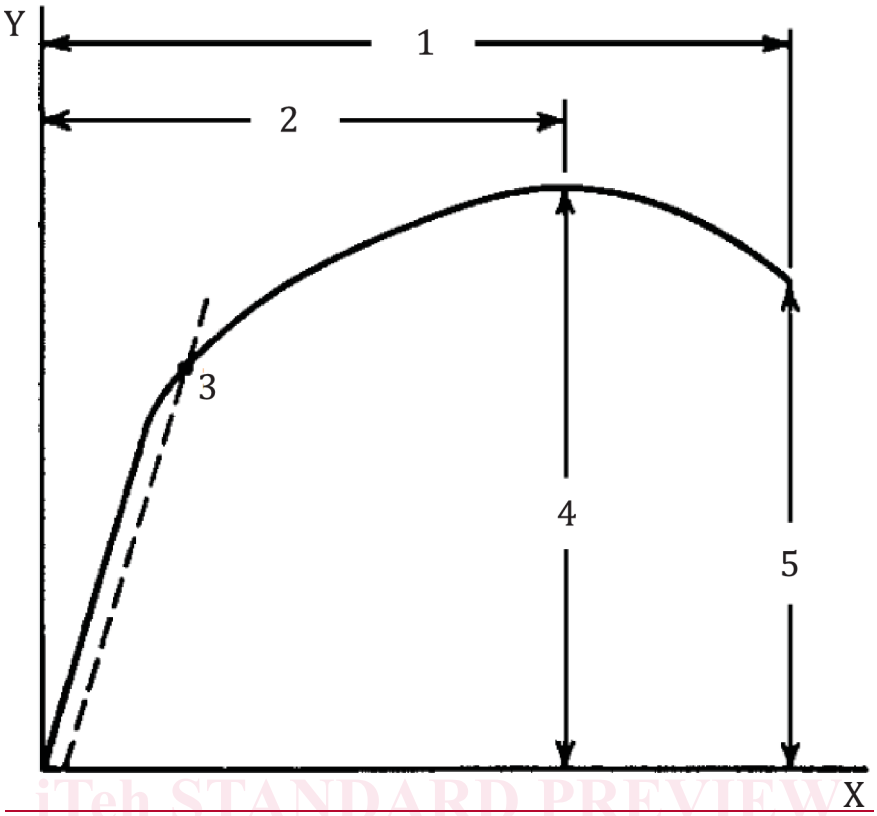
3.~~15~~14
gauge length
distance between the two effective clamping points of a testing device

Note 1 to entry: The effective clamping points (or lines) of jaws can be checked by clamping a test specimen under defined pretension with carbon copy paper to produce a gripping pattern on the test specimen and/or the jaw faces.

3.~~16~~15
initial length
length of a *test specimen* (3.11) under specified pretension between the two effective clamping points at the beginning of certain tests

Note 1 to entry: See also 3.15.





Key

X -conventional strain
Y -average stress
1 strain to fracture
2 uniform strain
3 offset yield strength
4 tensile strength
5 fracture stress

Figure -1— — Example of force-elongation curve

~~9~~4 Principle

A test specimen of specified dimensions is extended at a constant rate until it ruptures. The maximum force and the elongation at maximum force and, if required, the force at rupture and the elongation at rupture are recorded. Values for the breaking force and elongation of the test specimen are obtained from machine scales, dials, autographic recording charts, or a computer interface.

~~Note:~~ Comparison of results from tensile testing machines operating on different principles is not recommended. When different types of machines are used for comparison testing, constant time-to-break at (20~~±~~ ± 3) seconds is the established way of producing data. Even then the data can differ significantly. The constant-rate-of-extension tensile testing machine is preferred for this method.

~~10~~5 Reagents and materials

5.1 -**Grade 3 water**, in accordance with ISO 3696 for wetting test specimens.