INTERNATIONAL STANDARD

ISO 1421

Third edition
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Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break

Supports textiles revêtus de caoutchouc ou de plastique — Détermination de la force de rupture et de l'allongement à la rupture

Reference number
ISO 1421:2016(E)

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Foreword

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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 on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

This third edition cancels and replaces the second edition (ISO 1421:1998), which has been technically revised. The changes are as follows.

— In Clause 3, gauge length and reference points have been added and Figures 1, 2, and 3 have been moved to clarify the definitions.

— The title of Clause 5 has been changed.

— Clause 6 has been subdivided in two subclauses and conditions have been clarified respectively by referring to the particulars specified in ISO 2231:1989.

— A new clause has been added to specify the time-interval between manufacture and testing.

— In 8.1, two narrower widths of 10 mm and 30 mm have been added for test piece and the pre-tension forces have been revised accordingly. The procedure for the test pieces with reference mark has been incorporated.

— In 8.2, the procedure for handling abnormal test results has been modified.

Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This International Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This International Standard specifies two methods for the determination of the tensile strength of fabrics coated with rubber or plastics.

— Method 1 — the strip test method, which is a method for the determination of tensile strength and elongation at break.

— Method 2 — the grab test method, which is a method for the determination of tensile strength only.

The methods apply to test pieces in equilibrium with specific standard atmospheres for testing and to wet test pieces. Both methods require the use of a constant rate of extension (CRE) tensile-testing machine.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2231:1989, *Rubber- or plastics-coated fabrics — Standard atmospheres for conditioning and testing*

ISO 2286-2, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate*

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

3 Terms and definitions

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

3.1
constant rate of extension
CRE
means of conducting a tensile test in which the rate of increase in the length of the test piece is uniform with time

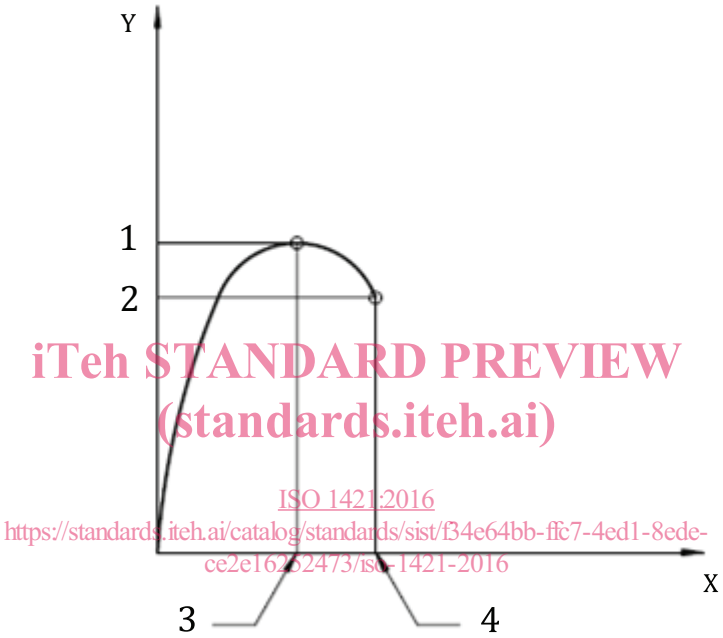
Note 1 to entry: The rate of increase of the force is dependent upon the extension characteristics of the test piece.

3.2
elongation
extension
E
increase in length of a test piece

Note 1 to entry: It is expressed in units of length, e.g. cm or mm.

3.3
elongation at break
elongation (3.2) of a test piece corresponding to the force at the breaking point

Note 1 to entry: See Figure 1. It is usually expressed as a percentage of the *nominal gauge length* (3.9).

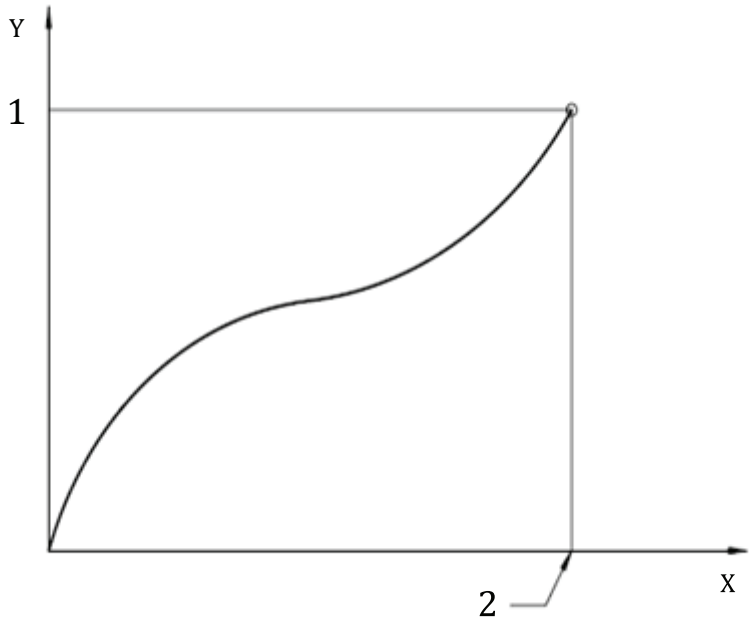


Key
X elongation, *E*
Y force
1 maximum force
2 force at break
3 elongation at maximum force
4 elongation at break

Figure 1 — Tensile force at break

3.4
elongation at maximum force
elongation (3.2) of a test piece produced by the maximum force

Note 1 to entry: See Figure 1, Figure 2 and Figure 3.



Key

X elongation, *E*
Y force
1 maximum force
2 elongation at maximum force

Figure 2 — Maximum force at break

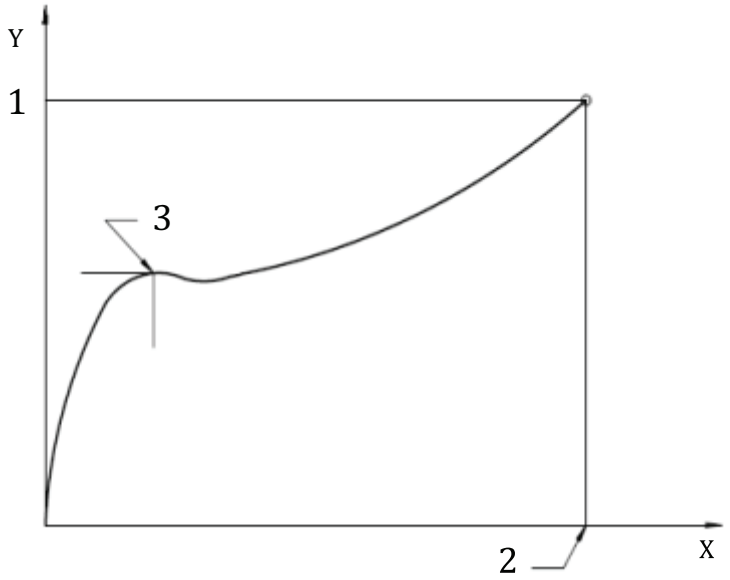
3.5
force at break
tensile force recorded at the moment of break

Note 1 to entry: See Figure 1.

Note 2 to entry: Figure 3 corresponds to the rupture of one of the elements constituting the coated fabric. Typical examples are:

a) a “rigid” polymer layer on an extensible fabric: rupture of the polymer layer;

b) a very extensible, thick polymer layer on a weak, less extensible fabric or nonwoven: rupture of the woven fabric or of the nonwoven.



Key

X elongation, *E*
Y force
1 maximum force
2 elongation at maximum force
3 rupture of one element

Figure 3 — Rupture of one element of a coated fabric

3.6
gauge length
length at a test piece prior to the addition of the pre-tension loaded, measured either from nip to nip of the jaws of the holding clamps or between the *reference points* (3.11)

3.7
grab test
tensile strength test in which only the central part of the width of the test piece is gripped in the jaws

3.8
maximum force
maximum force recorded in extending the test piece to breaking point

Note 1 to entry: See Figure 1, Figure 2 and Figure 3.

3.9
nominal gauge length
length of a test piece under a specified pre-tension, measured either from nip to nip of the jaws of the holding clamps with the clamps or between the *reference points* (3.11) in their starting position

3.10
percentage elongation
elongation (3.2) expressed as a percentage of the *nominal gauge length* (3.9)

3.11
reference points
two marks which are usually lines perpendicularly across the width of 100 mm apart marked on the surface of a test piece equidistantly from the middle point

3.12
strip test
tensile strength test in which the full width of the test piece is gripped in the jaws

4 Principle

A test piece is extended at a constant rate of extension until it breaks. For Method 1 (see Clause 8), the maximum force and the elongation at maximum force and, if required, the force at break and the elongation at break are determined. For Method 2 (see Clause 9), only the maximum force is determined.

5 Apparatus and reagents

5.1 Constant rate of extension (CRE) tensile testing machine, having the following general characteristics.

The machine shall be provided with means for reading and recording both the force applied to the test piece in stretching it to the breaking point and the corresponding extension of the test piece. It shall be provided with a strength indicator having several scales in order to ensure that the rupture of each test piece is obtained with a strength of 15 % to 85 % of the maximum of the scale used. Under conditions of use, the accuracy of the apparatus shall be class 1 as defined in ISO 7500-1. The error of the indicated or recorded maximum force at any point in the range in which the machine is used shall not exceed ±1 %, and the error of the indicated or recorded jaw separation shall not exceed 1 mm. After the first 2 s of the test, the rate of increase in the distance between the clamps shall be uniform to within 5 %. If the force and elongation are recorded by means of data acquisition boards and software, the frequency of data collection shall be at least 8 s^{-1}.

5.2 Clamping device, with the central point of the two jaws of the machine in the line of pull, the front edges at right angles to the line of pull and their clamping faces in the same plane. The jaws shall be capable of holding the test piece without allowing it to slip. They shall be designed so that they do not damage the test piece or reduce its strength. Smooth, flat or engraved corrugated jaws can be used for clamping. Using suitable packing materials in the jaws, e.g. paper, leather, plastics or rubber, avoids difficulties in clamping in many cases.

When tests are carried out and the test pieces either break at the jaws or tend to slip, the results may often be discarded. In order to obtain legitimate results by avoiding jaw breaks and the effect of slippage, the use of capstan jaws or any other self-locking device can be a suitable alternative to ordinary flat jaws. When information on strain is required, elongation measurements are made by means of an extensometer which follows the movements of two reference points on the test piece. The use of such jaws and an extensometer shall be reported in the test report; see 9.4 h).

For the strip test method, the jaws shall be not less than the width of the test piece and should preferably have a width of at least 60 mm.

For the grab test method, the dimensions of one of the jaws of each clamp shall be 25 mm ± 0,5 mm by 25 mm ± 0,5 mm. The other jaw of each clamp shall be at least as wide as the one to which it is attached and should preferably be 50 mm wide.

5.3 Equipment for cutting test pieces and fraying them down to the required width.

5.4 Equipment in which the test pieces can be immersed in water prior to wet testing.

5.5 Distilled or deionized water, for wetting out the test pieces.

5.6 Wetting agent or surfactant.