INTERNATIONAL STANDARD

ISO 13934-1

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Textiles — Tensile properties of fabrics —

Part 1:
Determination of maximum force and elongation at maximum force using the strip method

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Textiles — Propriétés des étoffes en traction —
Partie 1: Détermination de la force maximale et de l'allongement à la force maximale par la méthode sur bande

ISO 13934-1:1999
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Foreword

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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.

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International Standard ISO 13934-1 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 38, *Textiles*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "..this European Standard..." to mean "...this International Standard...".

ISO 13934 consists of the following parts, under the general title *Textiles — Tensile properties of fabrics*:

— *Part 1: Determination of maximum force and elongation at maximum force using the strip method*

— *Part 2: Determination of maximum force using the grab method*

Annexes A to C of this part of ISO 13934 are for information only.

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Foreword

The text of EN ISO 13934-1:1999 has been prepared by Technical Committee CEN/TC 248 "Textiles and textile products", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 38 "Textiles".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1999, and conflicting national standards shall be withdrawn at the latest by August 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This part of EN ISO 13934 has been prepared in the context of several test methods for determination of certain mechanical properties of textiles using mainly tensile testing machines, e.g. tensile properties, seam tensile properties, tear properties, seam slippage. The procedure for these standards agree where appropriate. The results obtained by one of the methods should not be compared with those obtained by the other methods.

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ISO 13934 consists of the following parts, under the general title Textiles - Tensile properties of fabrics:

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- Part 1: Determination of maximum force and elongation at maximum force using a strip method

- Part 2: Determination of maximum force using a grab method

Annexes A, B and C of this part of EN ISO 13934 are for information only.

1 Scope

This part of EN ISO 13934 specifies a procedure to determine the maximum force and elongation at maximum force of textile fabrics using a strip method.

Note: Part 2 of EN ISO 13934 describes the method known as the grab method. For informative references see annex C.

The method is mainly applicable to woven textile fabrics. It can be applicable to fabrics produced by other techniques. It is not normally applicable to woven elastic fabrics, geotextiles, nonwovens, coated fabrics, textile-glass woven fabrics and fabrics made from carbon fibres or polyolefin tape yarns (see annex C).

The method specifies the determination of the maximum force and elongation at maximum force of test specimens in equilibrium with the standard atmosphere for testing, and of test specimens in the wet state.

The method is restricted to the use of constant rate of extension (CRE) testing machines.

2 Normative references

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

EN 20139	Textiles - Standard atmospheres for conditioning and testing (ISO 139:1973)
ISO 3696	Water for analytical laboratory use - Specification and test methods
EN 10002-2	Metallic materials - Tensile testing - Part 2: Verification of the force measuring system of the tensile testing machines
EN 30012-1	Quality assurance requirements for measuring equipment - Part 1: Metrological confirmation system for measuring equipment (ISO 10012-1:1992)

3 Definitions

For the purposes of this part of EN ISO 13934 the following definitions apply:

3.1 Constant-rate-of-extension (CRE) testing machine

Tensile-testing machine provided with one clamp which is stationary and another clamp which moves with a constant speed throughout the test, the entire testing system being virtually free from deflection.

3.2 Strip test

Tensile test in which the full width of the test specimen is gripped in the jaws of the testing machine.

3.3 Gauge length

Distance between the two effective clamping points of a testing device.

Note : 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.

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3.4 Initial length

Length of a test specimen under specified pretension between the two effective clamping points at the beginning of certain tests (see also 3.3).

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3.5 Pretension

Force applied to a test specimen at the beginning of certain tests.

Note : Pretension is used to determine the initial length of the test specimen (see also 3.4 and 3.7).

3.6 Extension

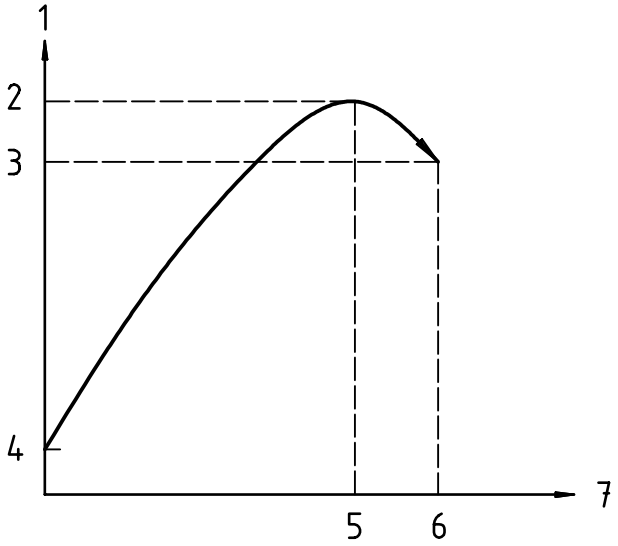
Increase in length of a test specimen produced by a force. It is expressed in units of length.

3.7 Elongation

Ratio of the extension of a test specimen to its initial length, expressed as a percentage.

3.8 Elongation at maximum force

Elongation of a test specimen produced by the maximum force (see figure 1).



1. Force
2. Maximum force
3. Force at rupture
4. Pretension
5. Elongation at max. force
6. Elongation at rupture
7. Elongation

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Figure 1 : Example of force-elongation curve

3.9 Elongation at rupture

Elongation of a test specimen corresponding to the force at rupture (see figure 1).

3.10 Force at rupture

Force recorded at the point of rupture of a test specimen during a tensile test (see figure 1).

3.11 Maximum force

The maximum force recorded when a test specimen is taken to rupture during a tensile test under the specified conditions (see figure 1).

4 Principle

A fabric 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.

5 Sampling

Select samples either in accordance with the procedure laid down in the material specification for the fabric, or as agreed between the interested parties.

In the absence of an appropriate material specification the example of a suitable sampling procedure given in annex A may be used.

An example of a suitable pattern for cutting test specimens from the laboratory sample is given in annex B. Avoid test specimens from folded or creased areas, selvedges and areas not representative of the fabric.

6 Apparatus

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6.1 CRE machine

Metrological confirmation system of the tensile-testing machine shall be in accordance with EN 30012-1.

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The constant-rate-of-extension (CRE) machine shall have the general characteristics given in 6.1.1 to 6.1.6.

6.1.1 The tensile-testing machine shall be provided with means for indicating or recording both the force applied to the test specimen in stretching it to rupture and the corresponding extension of the test specimen. Under conditions of use, the accuracy of the apparatus shall be class 1 of EN 10002-2. 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.

6.1.2 If a class 2 tensile-testing machine according to EN 10002-2 is to be used, this shall be stated in the test report.

6.1.3 If recording of force and elongation is obtained by means of data acquisition boards and software, the frequency of data collection shall be at least eight per second.

6.1.4 The machine shall be capable of constant rates of extension of 20 mm/min and 100 mm/min, with an accuracy of ± 10 %.

6.1.5 The machine shall be capable of setting the gauge length to 100 mm and 200 mm, to within ± 1 mm.

6.1.6 The clamping device of the machine shall be positioned with the centre of the two jaws in the line of applied force, the front edges shall be at right angles to the line of applied force and their clamping faces shall be in the same plane.

The jaws shall be capable of holding the test specimen without allowing it to slip and designed so that they do not cut or otherwise weaken the test specimen.

The faces of the jaws shall be smooth and flat, except that when, even with packing, the test specimen cannot be held satisfactorily with flat-faced jaws, engraved or corrugated jaws can be used to prevent slippage. Other auxiliary materials for use with either smooth or corrugated jaws to improve specimen gripping include paper, leather, plastics or rubber.

Note : If jaw breaks or slippage cannot be prevented with flat jaws, capstan jaws have often been found suitable. Extension measurement can be carried out by means of an extensiometer which follows the movement of two reference points on the test specimen.

The jaws preferably should have a width of at least 60 mm but shall not be less than the width of the test specimen.

6.2 Equipment for cutting test specimens and for fraying them to obtain the required width.

6.3 Equipment in which test specimens can be immersed in water preparatory to wet testing.

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6.4 Grade 3 water in accordance with ISO 3696 for wetting test specimens.

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6.5 Nonionic wetting agent.

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7 Atmosphere for conditioning and testing

The atmospheres for preconditioning, conditioning and testing shall be as specified in EN 20139.

Note : It is recommended that samples be conditioned for at least 24 h in the relaxed state.

Preconditioning and conditioning are not required for tests in the wet condition.

8 Preparation of test specimen

8.1 General

From each laboratory sample cut two sets of test specimens, one set in the warp direction and the other in the weft direction (or in the machine and cross-machine directions, where applicable).

Each set shall consist of at least five test specimens, except that if a higher degree of precision is required, more test specimens shall be tested. In accordance with clause 5 and annex B no test specimens shall be cut from within 150 mm of either edge of the laboratory sample. No test specimen taken from the warp direction shall contain the same longitudinal threads and no test specimen taken from the weft direction shall contain the same picks.