INTERNATIONAL STANDARD

ISO 13934-2

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Textiles — Tensile properties of fabrics —

Part 2:
Determination of maximum force using the grab method

Textiles — Propriétés des étoffes en traction —

Partie 2: Détermination de la force maximale par la méthode d'arrachement (Grab test)

Reference number
ISO 13934-2:1999(E)

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 13934-2 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 D of this part of ISO 13934 are for information only.

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Foreword

The text of EN ISO 13934-2:1999 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of an identical text or by endorsement, at the latest by August 1999, and conflicting national standards shall be withdrawn at the latest by August 1999.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 procedures for these International Standards agree where appropriate. The results obtained by one of the methods should not be compared with those obtained by the other methods. See annex D for informative references.

This edition cancels and replaces ISO 5082:1982.

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

1 Scope

This part of EN ISO 13934 specifies a procedure for the determination of maximum force of textile fabrics known as the grab test.

Note : Part 1 of EN ISO 13934 describes the method known as the strip test. For informative references see annex D.

The method is mainly applicable to woven textile fabrics. It may 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 D).

The method specifies the determination of the 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

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 (EN ISO 13934-1).

3.2 Grab test

Tensile test in which only the centre part of the test specimen is gripped in the jaws of the testing machine.

3.3 Maximum force

The maximum force recorded when a test specimen is taken to rupture during a test under the specified conditions
(EN ISO 13934-1).

3.4 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 specified pretension with carbon copy paper to produce a gripping pattern on the test specimen and/or the jaw faces (EN ISO 13934-1).

4 Principle

A fabric test specimen is gripped in its centre part by jaws of specified dimensions is extended at constant rate until it ruptures. The maximum force is 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 with folded or creased areas, selvedges and areas not representative of the fabric.

6 Apparatus

6.1 CRE machine.

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

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 the force applied to the test specimen in stretching it to rupture. 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 %.

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 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 rate of extension of 50 mm/min, with an accuracy of ± 10 %.

6.1.5 The machine shall be capable of setting the gauge length to 100 mm or, if agreed, to 75 mm, to within ± 1 mm.

6.1.6 The clamping device of the machine shall be positioned with the central point 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.

For the grab test the dimensional clamping area of the fabric shall be (25 mm ± 1 mm) x (25 mm ± 1 mm). This area can be achieved by either method a) or method b) described below and illustrated in annex C.

a) One clamp (25 mm) x (40 mm min., preferably 50 mm), positioned with the wider direction of the clamp perpendicular to the line of application of the force; a second clamp of the same dimensions positioned perpendicular to the first so that the wider direction of the clamp is parallel to the direction of application of the force.

b) One clamp (25 mm) x (40 mm min., preferably 50 mm), positioned with the wider direction of the clamp perpendicular to the line of application of the force; a second clamp 25 mm x 25 mm.

6.2 Equipment for cutting test specimens.

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

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

6.5 Nonionic wetting agent.

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 specimens

8.1 General

From each laboratory sample two sets of test specimens shall be cut, 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.

8.2 Dimensions

The width of each test specimen shall be 100 mm ± 2 mm and its length shall be long enough to secure the gauge length of 100 mm.

8.3 Preparation of test specimens

On each test specimen a line shall be drawn at a distance of 38 mm from one edge, parallel to either warp or weft threads or - where applicable - machine or cross-machine direction, running the full length of the test specimen.

8.4 Wet test specimens

8.4.1 When the maximum force of the wet fabric is required in addition to the maximum force when dry, test specimens of the appropriate width and at least twice as long as the test specimens required for a dry test shall be cut (see annex B). Each end of each strip shall be numbered, and then each test specimen shall be cut crosswise into two parts, one for determining the dry maximum force and the other for determining the wet maximum force. This ensures that each pair of test specimens contains the same longitudinal yarns. For fabrics where it is suspected or known from previous experience that excessive shrinkage will occur when wet, the length of test specimens for the determination of wet maximum force shall be greater than that of test specimens for dry maximum force tests.

8.4.2 Wet test

For tests in the wet condition immerse the test specimen for a period of 1 h in grade 3 water in accordance with ISO 3696 at a temperature of 20°C ± 2°C. An aqueous solution containing not more than 1 g of a nonionic wetting agent per litre may be used instead of water.

Note : For tropical regions, temperature according EN 20139 may be applied.

9 Procedure

9.1 Gauge length

Set the gauge length of the tensile-testing machine to 100 mm or, if agreed, to 75 mm, to within ± 1 mm.

9.2 Rate of extension

Set the rate of extension of the tensile-testing machine to 50 mm/min.

9.3 Mounting of test specimens

Clamp a test specimen centrally so that its longitudinal centre line passes through the centre point of the front edges of the jaws and is perpendicular to the edges of the jaws and so that the line drawn on the test specimen coincides with one edge of the jaws.

After closing the upper jaw, avoid pretension when adjusting the specimen along the guide line in the lower jaw so that the fabric hangs under its own weight when the lower clamp is closed.

9.4 Operation

Engage any device for recording the maximum force. Put the movable clamp in motion and extend the test specimen to the point of rupture. Record the maximum force in newtons. Perform the test at least on five test specimens of each fabric direction.

Record any break which occurs within 5 mm of the clamping line of the jaws and report the result as a jaw break. At the end of the five tests examine the results obtained. If any of the jaw break results falls above the lowest "normal" break result, then it can be included. If any of the jaw break results falls below the lowest "normal" break result then it shall be excluded and further tests carried out to obtained five "normal" breaks.

If all the results are jaw breaks, or if five "normal" breaks can not be obtained then the individual results shall be reported without the coefficient of variation or confidence limits. Jaw break results shall be indicated as such in the report, and the results discussed between the interested parties.

9.5 Tests on wet test specimens

Perform the test according to 9.1 to 9.4 immediately after removal of a test specimen from the liquid (see 8.4.2) and briefly placing it on blotting paper to remove excess water.

10 Calculation and expression of results

Calculate the arithmetic mean of the maximum force, in newtons, for each direction tested.

Round the results for values

< 100 N to the nearest 1 N
≥ 100 N to < 1000 N to the nearest 10 N
≥ 1000 N to the nearest 100 N.

If required calculate the coefficient of variation to the nearest 0,1 % and the 95 % confidence limits rounded to the same precision as the mean value.

11 Test report

The test report shall include the following information:

a) Reference to this part of EN ISO 13934 and the date of test;

b) identification of test sample and sampling procedure, if required;

c) state of test specimens (conditioned or wet);

d) number of test specimens including the number of tests rejected and reasons for this;

e) gauge length, if not 100 mm;

f) any deviation from the given procedure;

g) arithmetic mean of the maximum force, in newtons;

h) if required, the coefficient of variation of the mean value, in percent;

i) if required, the 95% confidence limits of the mean value, in newtons.

Annex A (informative) Suggested procedure for sampling

A.1 Bulk sample (number of pieces from a shipment or lot)

The appropriate number of pieces should be taken at random from the shipment or lot as specified in table A.1. No piece that shows signs of damage or dampness incurred during transit should be included in the sample.

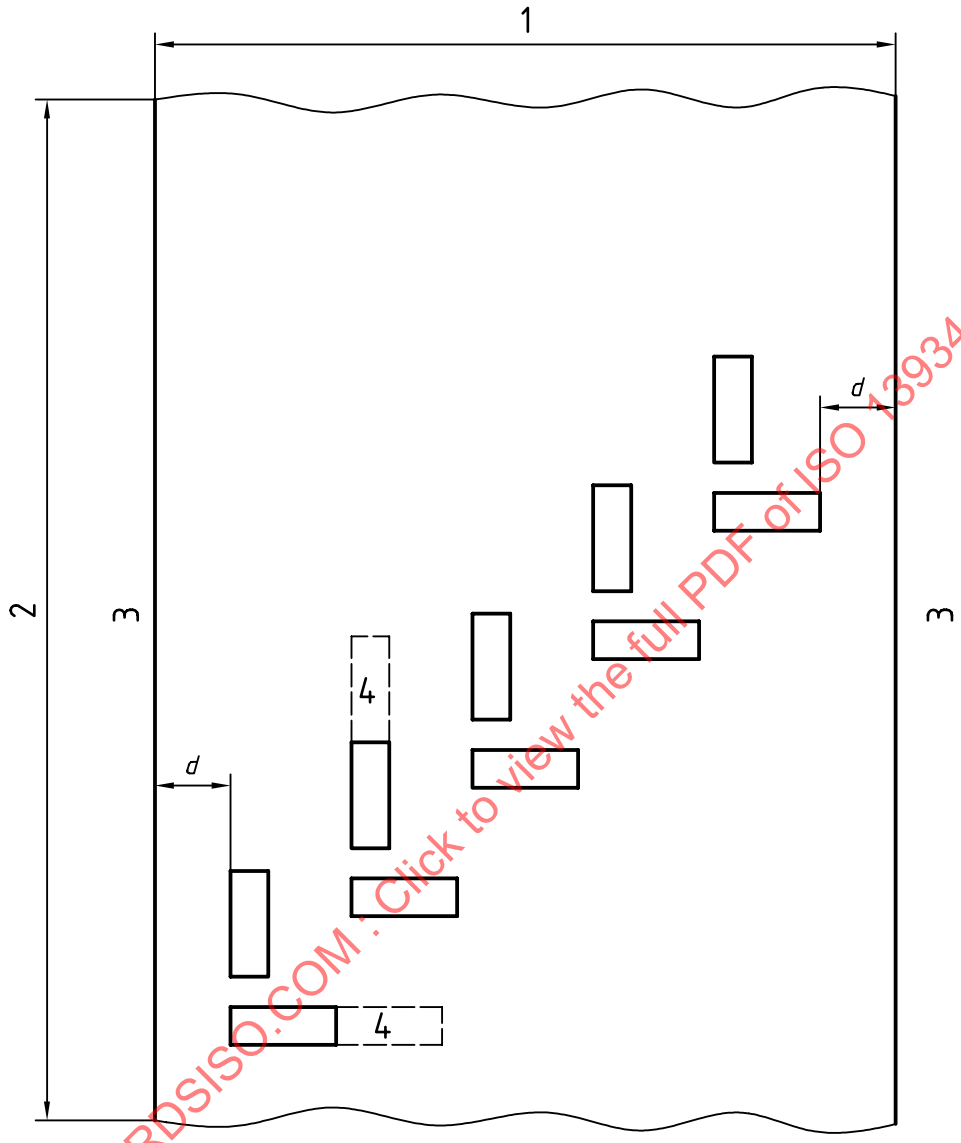
Table A.1 - Bulk sample

Number of pieces in shipment or lot	Number of pieces in bulk sample, minimum
3 or less	1
4 to 10	2
11 to 30	3
31 to 75	4
76 or more	5

A.2 Number of laboratory samples

From each piece in the bulk sample, a laboratory sample of length at least I m and of full width should be cut (from a position taken at random but at least 3 m from an end of the piece). Areas that are creased or that have a visible fault should not be included in the sample.

Annex B (informative) Locations of test specimens cut from a laboratory sample



1. Width of fabric
2. Length of fabric
3. Edge
4. Additional length for wet tests, if required

d = 150 mm

Figure B.1 Locations of test specimens cut from a laboratory sample