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Textiles — Determination of the elasticity of fabrics —

Part 1: Strip tests

Textiles — Détermination de l'élasticité des étoffes —

Partie 1: Essais sur bande

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A list of all parts in the ISO 20932 series can be found on the ISO website.

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Introduction

This document was developed as a result of technical advancements in yarn and fabric structures and properties, which increase product range and developments.

This document is based on EN 14704-1[1].

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Textiles — Determination of the elasticity of fabrics —

Part 1:
Strip tests

1 Scope

This document describes the methods of test using strips of fabric in straight strip form or as loops, which can be used to measure elasticity and related properties of fabrics, excluding narrow fabrics.

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 4915, *Textiles — Stitch types — Classification and terminology*

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

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

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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 http://www.electropedia.org/

3.1
narrow fabric
woven or knitted construction intended for use as a trim, binding, edging, strapping or harness, and designed to be used in its full width

3.2
elasticity
<material> ability to recover original size and shape immediately after the removal of the force causing deformation

3.3
constant-rate-of-extension testing machine
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

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3.4
strip test specimen
test specimen in which the full width is gripped in the jaws of the testing machine

3.5
loop test specimen
test specimen in which a seam is made to create a loop of the full width of the specimen and which is placed around a loop bar assembly positioned on the testing machine

Note 1 to entry: This method of preparation is useful when any ageing or exposure testing is to be carried out on the specimens after measurement.

3.6
gauge length
distance between the two effective clamping or holding points of a testing device

Note 1 to entry: For strip tests, method A: distance between the two contact points of the line clamps.

Note 2 to entry: For loop tests, method B: half of the circumference around the loop bar assembly.

3.7
slack mounting
insertion of a *strip test specimen* (3.4) in the line clamps of the upper jaw, allowing it to hang freely under its own weight, guided by the hand to ensure perpendicular alignment to the line of pulling force, without any force being applied

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3.8
initial length
length of the test specimen between the two effective clamping or holding points, at the beginning of the test (after *slack mounting* (3.7) or under specified pretension)

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3.9
pretension
force applied to a test specimen at the beginning of certain tests

Note 1 to entry: Pretension is used to determine the initial length of the test specimen.

[SOURCE: ISO 13934-1:2013, 3.5, modified — References to 3.4 and 3.7 have been removed from Note 1 to entry.]

3.10
extension
increase in length of a test specimen during testing

Note 1 to entry: Extension is expressed in units of the length.

3.11
elongation
ratio of the *extension* (3.10) of the test specimen to its initial length

Note 1 to entry: Elongation is expressed as a percentage.

3.12
maximum force
force at the position when a test specimen is taken to a fixed *extension* (3.10)

Note 1 to entry: Maximum force is expressed in newtons.

3.13
maximum extension
extension (3.10) recorded in millimetres at the position when a test specimen is taken to a fixed load

Note 1 to entry: Maximum extension is expressed in units of the length.

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3.14
force at specified elongation
force measured at a given *elongation* (3.11) on either the load or unload curves

3.15
cycle
process whereby a fabric is taken from the *gauge length* (3.6) to a fixed load or fixed extension or elongation and returned to gauge length

3.16
force decay due to time
loss of force measured over time when a test specimen is stretched to a specified elongation or force and held at this position for a given time period

Note 1 to entry: The decay in force is expressed as a percentage of the original force recorded at the specified position (see Annex A, Figure A.1).

3.17
force decay due to exercising
loss of force, calculated and expressed as a percentage, as measured and recorded at the same elongation point on two different cycles when the test specimen is cycled several times between the *gauge length* (3.6) and a specified elongation

Note 1 to entry: See Annex A, Figure A.1.

3.18
permanent deformation
ratio of unrecovered extension of the test specimen after cycling (to a specified force or specified extension) to its initial length

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Note 1 to entry: Permanent deformation is expressed as a percentage.

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3.19
recovered elongation
complement of *permanent deformation* (3.18) to 100 %

Note 1 to entry: Recovered elongation is expressed as a percentage.

3.20
elastic recovery
recovered elongation (3.19) of the total elongation

Note 1 to entry: Elastic recovery is expressed as a percentage.

4 Principle

A fabric test specimen of specified dimensions is extended at a constant rate to either a specified force or elongation for an agreed number of cycles, and its elasticity determined by measuring certain characteristics.

5 Sampling

Fabric samples shall be selected in accordance with the product specification. In the absence of a product specification for the fabric, the sampling method given in Annex B may be used.

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6 Apparatus

6.1 CRE testing machine.

Metrological confirmation system of the tensile testing machine shall be in accordance with ISO 10012.

The constant-rate-of-extension (CRE) testing machine shall conform to the following.

a) The tensile testing machine shall be provided with the means for indicating or recording the force and elongation values when cycling between gauge length and either a fixed load or fixed extension. Under conditions of use, the accuracy of the apparatus shall be at least class 1 of 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.

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

c) The machine shall be capable of constant rates of extension including 20 mm/min to 500 mm/min with an accuracy of ±10 %.

d) The machine shall be capable of variable gauge length settings including 100 mm to 250 mm, to an accuracy of ±1 mm.

e) The clamping or holding devices shall be positioned with their central point in line of the applied force. The machine shall be calibrated with the clamping or holding devices in position and the jaw faces closed, where applicable.

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6.2 Line clamps (for method A).

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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.

Line clamps, as shown in Annex C, Figure C.1, shall consist of two jaws, one being of steel plate, the other having a convex 3 mm radius. The line of contact of the jaws shall be perpendicular to the line of increasing force. The clamping faces shall be in the same plane.

The line clamp jaws shall not be less than the width of the test specimen.

NOTE Significant levels of work have shown this type of line clamp is the preferred type for elastane/elastodiene containing fabrics as fabric slippage is insignificant. If a fabric slips, the elongation values are inaccurate.

Pneumatic operated grips are recommended as hand tightening of manual grips can cause distortion of the test specimen. The air pressure should be sufficient to prevent slippage when compensating the decreasing thickness of the fabric but should not cut or otherwise weaken the test specimen.

6.3 Loop bar assembly (for method B).

The loop bar assembly shall be as shown in Annex C, Figure C.2 a) or b) and typically comprises two steel bars of circular cross-section and the diameter between 4 mm and 8 mm. The specimen is looped over these bars and extended as the bars move apart. The axes of the bars shall be perpendicular to the line of increasing force. The steel bar holders shall have a minimum internal dimension of 80 mm.

6.4 Equipment, for cutting test specimens and for fraying, where applicable to the required dimensions.

6.5 Sewing machine, capable of producing a type 301 lockstitch as defined in ISO 4915, furnished with a medium ballpoint needle (90s SUK) and 470 decitex (ticket 75's) polyester core-spun thread.

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NOTE If there is a risk of damage to the fabric, a finer needle and corresponding polyester core spun thread can be used.

6.6 Calibrated metal rule, graduated in millimetres.

7 Atmosphere for conditioning and testing

The atmospheres for preconditioning, conditioning and testing shall be as specified in ISO 139.

The fabric samples shall be conditioned for a minimum of 20 h in a tension free state. The prepared test specimens shall be conditioned in a tension free state for a further 4 h after preparation, to minimize the effects of handling during preparation.

8 Preparation of test specimens

8.1 General

From each laboratory sample, a set of test specimens shall be cut in the direction(s) of the stretch.

A set shall consist of a minimum of five test specimens. No test specimen shall be cut from within 150 mm of either edge of the laboratory sample. No test specimen taken from the longitudinal direction shall contain the same yarns and no test specimen taken from the transversal direction shall contain the same yarns unless otherwise specified between interested parties.

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NOTE An example of a suitable pattern for cutting test specimens from laboratory sample is given in Annex D, Figure D.1.

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8.2 Test specimen preparation

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8.2.1 Woven fabrics

8.2.1.1 Strip test specimens (for method A)

Each test specimen shall be cut with its length parallel to the warp or the weft of the fabric and shall be sufficiently wide to allow the necessary fringes on both sides. Threads shall be removed in approximately equal numbers from each of the long edges of the cut strip to create fringes, until a width (not including the fringes) of (50,0 ± 1,0) mm or 1 complete thread, is achieved. The width of fringes shall be such that during testing no longitudinal threads escape the fringes. The length of the specimen shall be cut between 250 mm and 300 mm.

NOTE For the majority of fabrics, fringes of a width approximately 5 mm or 15 threads is sufficient. For very closely woven fabrics, a much narrower fringe might be satisfactory. Fabrics of very open weave can require up to 10 mm.

For fabrics, which cannot be frayed in this manner, test specimens shall be cut along lines (50,0 ± 1,0) mm apart and parallel to the machine or the cross-machine direction.

For fabrics in form of band with a maximum width of 100 mm, test specimen can be tested in full width without fraying them.

If permanent deformation is to be determined at the end of the test, place 100 mm reference (bench) marks parallel to the specimen short side, centrally on the specimen.

If a pretension is used, placing of reference marks is not required, since the length at pretension is used for calculation.

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