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Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics —

Part 3: Needle clamp method

Textiles — Détermination de la résistance au glissement des fils de couture dans les tissus —

Partie 3: Méthode de la griffe

Reference number
ISO 13936-3:2005(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 13936-3 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 24, *Conditioning atmospheres and physical tests for textile fabrics*.

ISO 13936 consists of the following parts, under the general title *Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics*:

— *Part 1: Fixed seam opening method*

— *Part 2: Fixed load method*

— *Part 3: Needle clamp needle*

Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics —

Part 3:
Needle clamp method

1 Scope

This part of ISO 13936 describes a method for the determination of the resistance offered by the yarns of a woven fabric to slippage while being held in a needle clamp under conditions of stress.

This method provides a means to negate variations introduced by seam preparation or sewing thread variation that can have a marked influence on test results.

This method is not applicable to stretch fabrics or for industrial fabric, e.g. beltings.

2 Normative references

The following referenced documents are indispensable for the application 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 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 10012-1, *Quality assurance requirements for measuring equipment — Part 1: Metrological confirmation system for measuring equipment*

3 Terms and definitions

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

3.1
constant rate-of-extension testing machine
tensile testing machine having one clamp fixed whilst the other is moving with a constant speed throughout the test where the entire testing system is virtually free from deflection

3.2
strip test
tensile test for which the full width of the test specimen is gripped in the jaws

3.3
yarn slippage
movement in a woven fabric of weft yarns over warp yarn (or warp yarns over weft yarns) as a result of a pulling action

NOTE Seam slippage is a fabric property not to be confused with seam strength.

3.4
warp slippage
slipping of warp yarns over weft yarns, during which the warp yarns are at right angles to the direction of pull

3.5
weft slippage
slipping of weft yarns over warp yarns, during which the weft yarns are at right angles to the direction of pull

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

4 Principle

A pinned and an unpinned test specimen are separately extended by using a tensile testing machine fitted with a needle-clamping device for the pinned specimen and conventional jaws for the unpinned specimen, to produce, in the case of the use of a chart recorder, two force/extension curves originating from the same abscissa. The yarn slippage, expressed in millimetres, is determined by comparing the two curves at specified force applications.

5 Apparatus and materials

5.1 CRE machine, having the following general characteristics.

a) The tensile-testing machine shall be provided with a means for indicating or recording both the maximum force applied to the test specimen in stretching it to rupture and the corresponding extension of the test specimen.

b) Under conditions of the use, the accuracy of the apparatus shall be at least class 1 in accordance with ISO 7500-1. The error of 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.

c) 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 8 per second. If the machine is not equipped with data acquisition boards and applicable software, a chart recorder is necessary.

d) The machine shall be capable of constant rates of extension of 50 mm/min ± 5 mm/min (and 20 mm/min ± 2 mm/min).

e) The machine shall be capable of gauge lengths of (100 ± 1) mm and (20 ± 1) mm.

f) Metrological confirmation of tensile testing machine shall be in accordance with ISO 10012-1.

5.2 Needle-clamp clamping device, with a row of needles on one side and corresponding holes on the other as shown in Figure 1.

The number and characteristics of these needles depend on the application of the fabrics as given in Table 1.

Table 1 — Number and characteristics of needle-clamp needles for different fabrics

Criteria	Apparel fabrics	Furnishing and upholstery fabrics
Number of needles per 5 cm width	17	7
Diameter of the needle shank (mm)	0,5 ± 0,03	0,9 ± 0,03
Space between axes of adjacent needles (mm)	2,5 ± 0,1	7,0 ± 0,1
Needle height (mm)	8,0 ± 0,1	8,0 ± 0,1
Type of needle	round point	round point

The stop position (see Figures 1 and 2) for apparel fabrics is different from that for furnishing and upholstery fabrics to ensure the correct positioning of the test specimen.

5.3 Conventional-jaws clamping device, having 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 specimen without allowing it to slip, and shall be designed so that they do not cut or otherwise weaken the test specimen. The faces of the jaws shall be smooth and flat, except if, even with packing, the test specimen cannot be held satisfactorily with flat-faced jaws or rubber-faced jaws; in these cases, engraved or corrugated jaws shall be used. Suitable packing materials for use with either smooth or corrugated jaws include paper, leather, plastics or rubber sheet.

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

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

6 Atmosphere for conditioning and testing

The standard atmosphere for conditioning and testing textiles shall be as specified in ISO 139.

7 Sampling and preparation of test specimens

7.1 Sampling

Select samples either in accordance with the procedure laid down in the material specifications for the fabric or as agreed between the interested parties. In case of the absence of specifications, an example sampling procedure is given in Annex A. An example of cutting test specimens from the laboratory sample is given in Annex B. Avoid test areas with folded or creased places, selvages and areas not representative of the fabric.

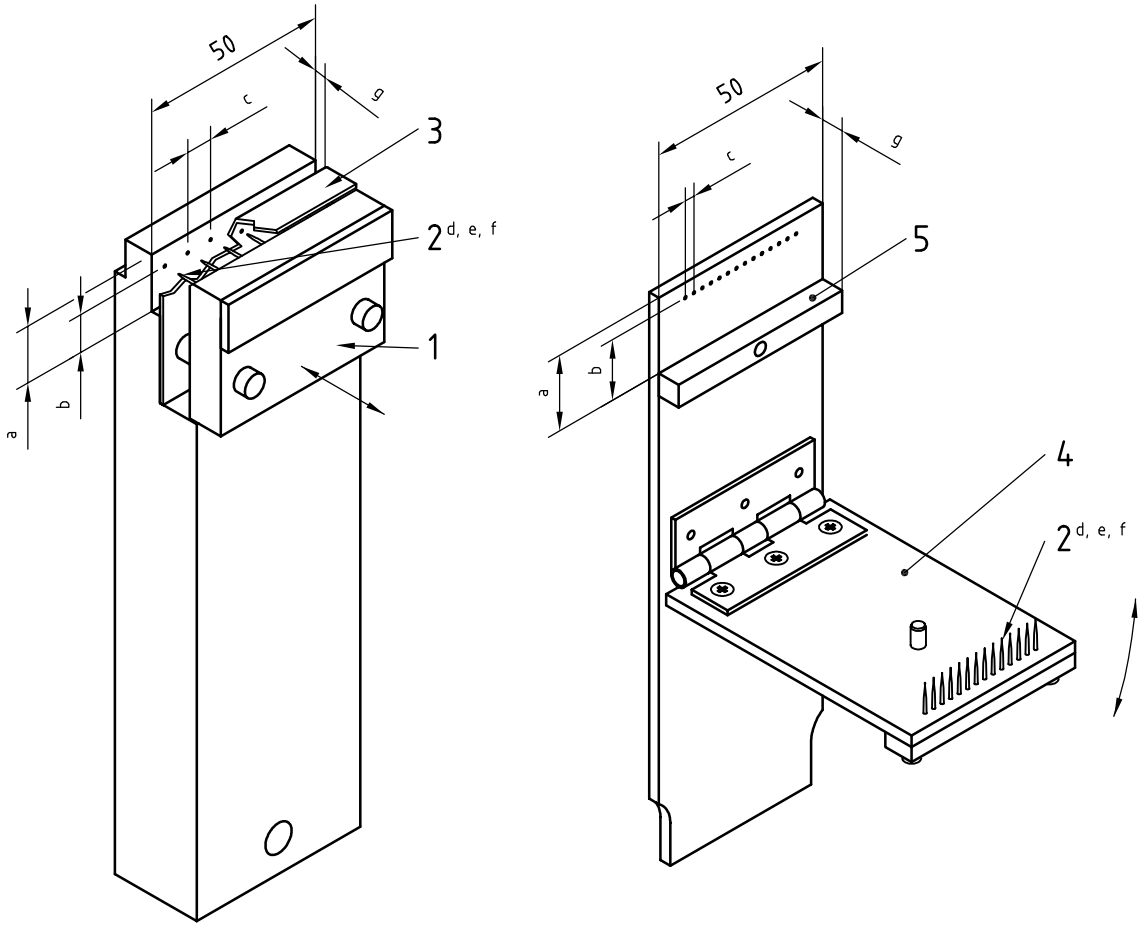
7.2 Preparation of test specimens

7.2.1 From each laboratory sample, cut two sets of 5 test specimens (300 mm long and 60 mm wide) 150 mm from the selvage, one set in the warp direction and the other in the weft direction.

7.2.2 Remove approximately the same number of threads from each of the long edges of the cut strip until the width of the test specimen is 50 mm.

7.2.3 Draw a reference line at half length of the test specimen and identify each end.

Dimensions in millimetres



Key

1 moving jaw (moving jaw clamping and opening mechanism not shown)

2 needles[d, e, f]

3 guard

4 hinged jaw

5 stop

Specifications of this part of ISO 13936:

Dimension or other characteristic		For furnishing and upholstery fabrics	For apparel fabrics
a	Distance from stop to top edge of pin device (mm)	20 ± 0,5	15 ± 0,5
b	Distance from stop to centre of pin line (mm)	15 ± 0,5	10 ± 0,5
c	Distance between axes of adjacent needles (mm)	7 ± 0,1	2,5 ± 0,1
d	Diameter of the needle base (mm)	0,9 ± 0,03	0,5 ± 0,03
e	Needle height (mm)	8 ± 0,5	8 ± 0,5
f	Number of needles	7	17
g	Fabric slot width (mm)	2,25 ± 0,25	2,25 ± 0,25

Figure 1 — Diagram of needle bar clamp with specified dimensions and characteristics

8 Test procedure

Condition the test specimens for a minimum of 24 h in accordance with Clause 6.

Set the tensile testing machine to give a constant rate of traverse of (50 ±5) mm/min.

Attach the two conventional clamps to the tensile testing machine.

Set the gauge length to (100 ± 1) mm.

Mount one end of the test specimen in the clamps as shown in Figure 2.

Set the moving clamp in motion, engage any device to record the force/extension curve and extend the test specimen until the force is equal to (250 ± 5) N.

Return the moving clamp to the original position and remove the specimen.

Place the needle clamp in the bottom jaw of the tensile testing machine (see Figure 1) or replace the conventional jaw by a needle clamp as described in Figure 1.

Move the clamps of the tensile testing machine until they are (100 ± 1) mm apart.

NOTE The gauge length is measured between the effective clamping point of the top jaw and the line of needles in the needle clamp.

Fasten the other end of the test specimen in the needle clamp by pressing the needles into the test specimen. The needles shall be parallel to the thread system across the width of the sample (see Figure 2).

The width of the test specimen shall lie parallel to the stop device. The positioning of the pins for the apparel fabric and the furnishing and upholstery fabric is defined in Figure 2.

Re-clamp the other end of test specimen in the top jaw in order to avoid a loose test specimen.

Put the moving clamp in motion, engage any device to record the force/extension curve and extend the test specimen until the force equals (250 ± 5) N.

The force of 250 N has been determined to result in a complete force/extension curve. A lower maximum force applied to the test specimen, depending on the type of fabrics, may be defined as follows:

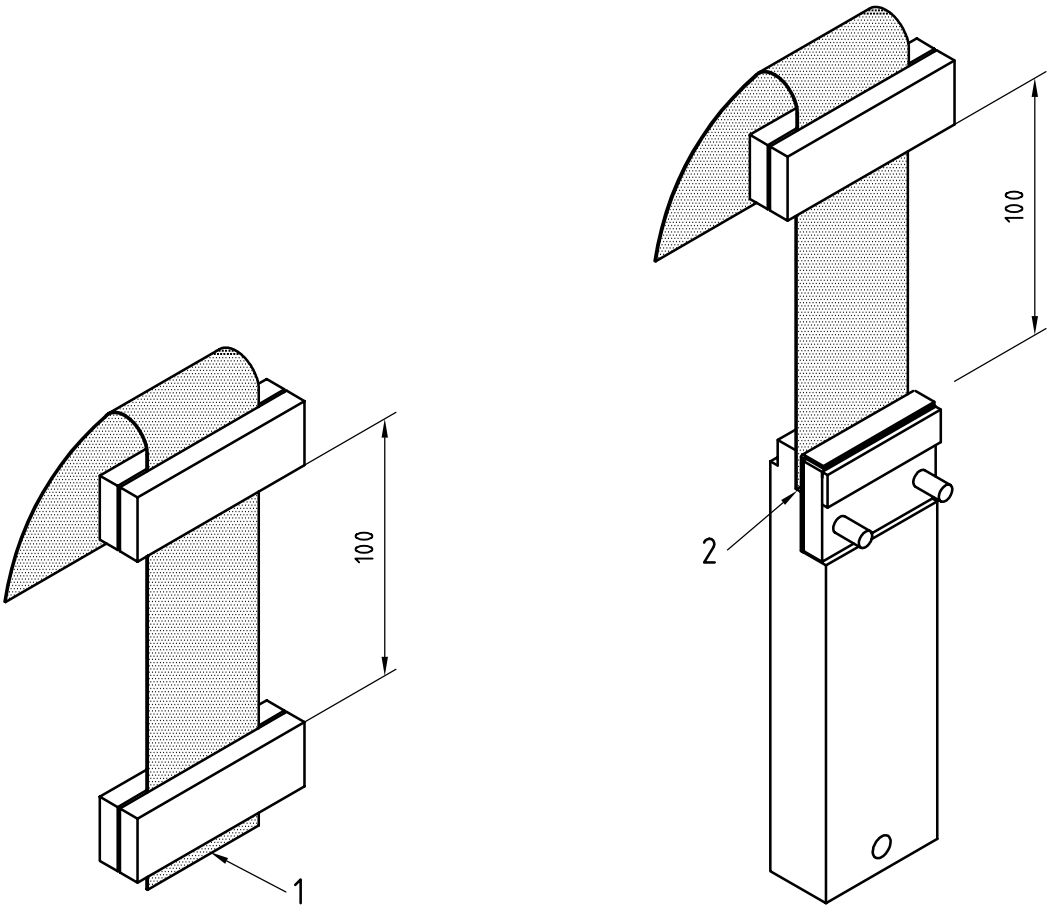
a) for apparel fabric (100 ± 5) N;

b) for furnishing and upholstery fabric (200 ± 5) N.

Return the moving clamp to the original position.

Repeat the test procedure (Clause 8) with the remaining test specimens so that one pairs of curves is produced for each test specimen.

Dimensions in millimetres



a) Conventional clamp **b) Needle clamp**

Key

1 equals (10 ± 1) mm for apparel fabric

2 equals (15 ± 1) mm for furnishing and upholstery fabric

Figure 2 — Position of test specimen

9 Calculation and expression of results

9.1 For each pair of curves, measure the distance, l_A, in millimetres to the nearest 0,5 mm between the tensile test curve and the slip test curve at the force of (5 ± 1) N. This is to compensate for initial straightening of the test specimens.

9.2 Determinate the distances, l_D, in millimetres to the nearest 0,5 mm, between the curves at the required force level(s).

9.3 For each force (100 N or 200 N), the slippage, l_S, in millimetres, is calculated in accordance with Equation (1):

$$l_S = l_D - l_A \quad (1)$$

where

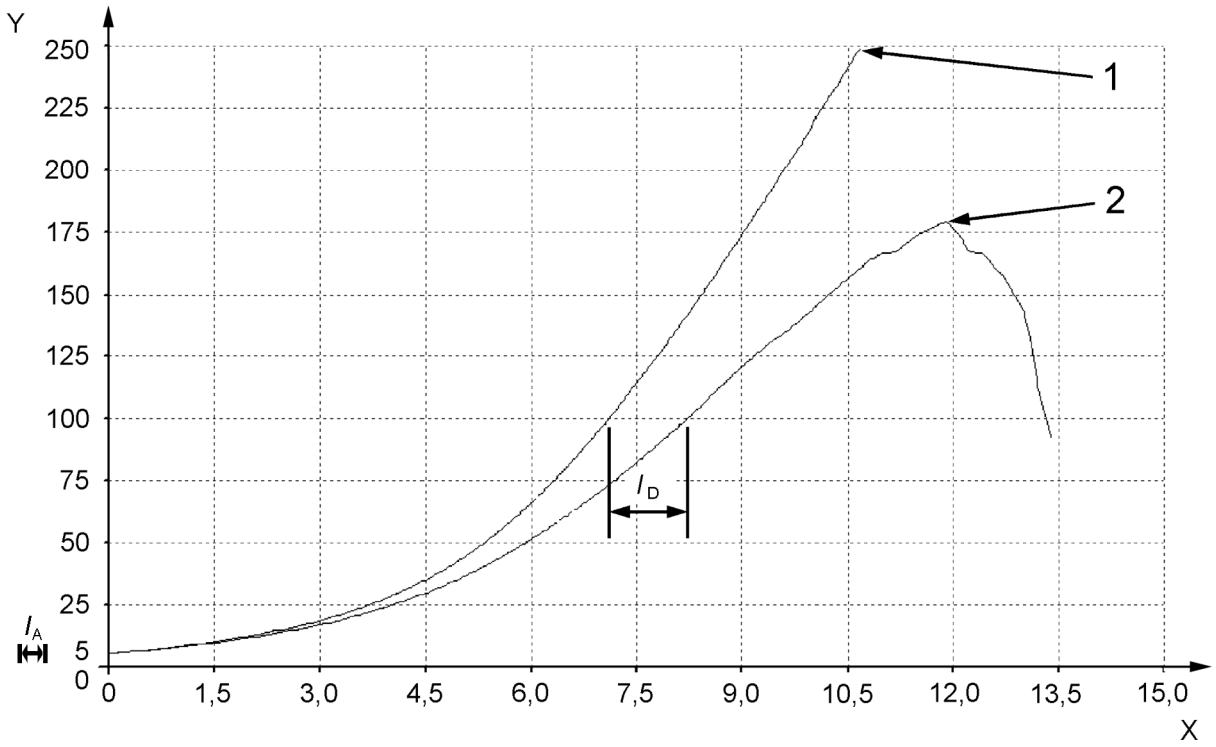
l_S is the slippage, expressed in millimetres, at force 100 N or 200 N;

l_D is the distance, expressed in millimetres, between a pair of curves at specified force;

l_A is the distance, expressed in millimetres, between a pair of curves at force 5 N.

9.4 Report the average of the five warp and five weft results separately to the nearest 0,5 mm for each of the specified forces (in a grid as shown in Table 2).

9.5 If fabric tears at the maximum force [as defined in 8 a) or 8 b)] or at a force less than 200 N, report the result as “fabric breakdown” and quote the force at which this occurred.



Key

X Extension, expressed in millimetres

Y Force, expressed in newtons

1 tensile strength of fabric curve

2 tensile strength using the needle clamp curve

l_A preload at 5 N

l_D slippage at 100 N, expressed in millimetres

Figure 3 — Typical graph

10 Test report

The test report shall include the following particulars:

a) reference to this part of ISO 13936, i.e. ISO 13936-3:2005;

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

c) end use of the fabric under test (apparel fabric or furnishing or upholstery fabric);

d) conditions of the test (type of needle clamp, maximum force chosen, bottom short end);

e) any deviation from given procedure.

f) slippage (average of five values), expressed in millimetres, at the mean specified force, i.e., for example, for “apparel fabric”, slippage at 100 N, in a grid such as shown in Table 2.

Table 2 — Grid for reporting slippage values

Force applied N	**Warp slippage** mm	**Weft slippage** mm
100		
200		

g) if applicable, a statement “fabric breakdown” and the force at which this occurred.

Annex A
(informative)

Suggested procedure for sampling

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

Table A.1 — Bulk sampling

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

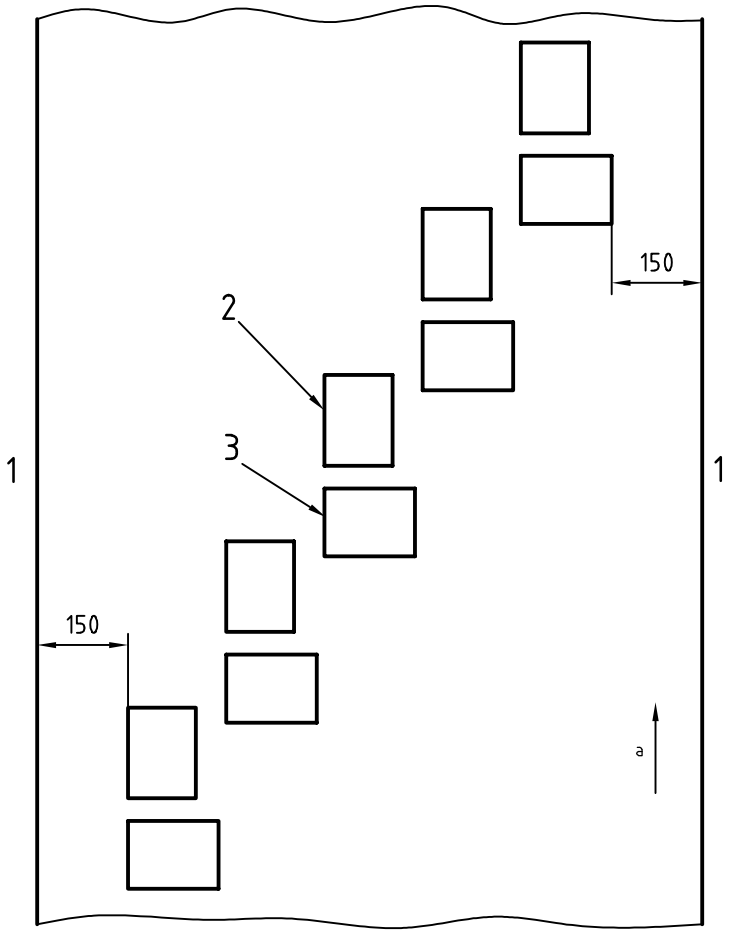
A.2 Number of laboratory samples

From each piece in the bulk sample, cut (from a position taken at random but at least 3 m from an end of the piece) a laboratory sample of the full width and at length at least 1 m long. Ensure that areas that are creased or that have a visible fault, or faults, are not included in the laboratory sample.

Annex B
(informative)

Example of pattern for cutting out test specimens from the laboratory samples

Dimensions in millimetres



Key

1 edge
2 specimen for warp slippage
3 specimen for weft slippage
a warp

Figure B.1 — Pattern for cutting test specimens

Annex C
(informative)

Alternative procedure for apparel fabrics

C.1 Important

Elongation of fabric could hide the slippage phenomenon. To perform the test, a smaller gauge length could be chosen.

In this case, the rate of elongation has to be the same as in the method, i.e. 50 % per min.

EXAMPLE For a gauge length of 20 mm, the rate of elongation is 50 % per minute, i.e. 10 mm/min.

Bibliography

[1] ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*

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