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Textile conveyor belts — Full thickness tensile strength, elongation at break and elongation at the reference load — Test method

Courroies transporteuses à carcasse textile — Résistance à la traction, allongement à la rupture et allongement sous force de référence en pleine épaisseur — Méthode d'essai

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 3, *Conveyor belts.*

This fourth edition cancels and replaces the third edition (ISO 283:2007), which has been technically revised.

Textile conveyor belts — Full thickness tensile strength, elongation at break and elongation at the reference load — Test method

1 Scope

This International Standard specifies a test method for the determination of the full thickness tensile strength in the longitudinal direction and the elongation at the reference force and breaking point of conveyor belts having a textile carcass. The method can also be used for the determination of full thickness tensile strength in the transverse direction and the elongation at the breaking point, for use when the manufacturer is requested by the purchaser to state values for these properties.

This International Standard is not suitable or valid for light conveyor belts as described in ISO 21183-1.

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 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 18573, *Conveyor belts — Test atmospheres and conditioning periods*

3 Terms and definitions

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

3.1
tensile strength
greatest measured force during the tensile test divided by the width of the test piece

Note 1 to entry: It is expressed in N/mm.

3.2
nominal tensile strength
specified minimum value of the tensile strength

Note 1 to entry: It is expressed in N/mm.

3.3
reference force
reference load
one-tenth of the nominal tensile strength in the longitudinal direction multiplied by the width of the test piece in mm

EXAMPLE Nominal tensile strength = 1 600 N/mm; one tenth of the nominal tensile strength = 160 N/mm; reference force for 25 mm test piece = 25 mm × 160 N/mm = 4 000 N.

Note 1 to entry: It is expressed in N/mm.

3.4
elongation at break
elongation at the greatest force (load)

Note 1 to entry: It is expressed as the percentage increase in the distance between two reference points.

3.5
elongation at the reference force (load)
elongation at the reference force (load) in the longitudinal direction

Note 1 to entry: It is expressed as the percentage increase in the distance between two reference points.

4 Principle

A test piece, cut from the full thickness of the conveyor belt, is extended under specified conditions using a tensile testing machine, until rupture of the test piece occurs.

5 Apparatus

5.1 Tensile testing machine, of CRE or CRT type, calibrated to Grade 1 according to ISO 7500-1 and capable of extending the test piece at a constant rate, without interruption, of (100 ± 10) mm/min.

5.2 Device, such as an extensometer, with a measuring length of at least 100 mm and accurate to within 0,1 mm or better, capable of measuring the elongation of the gauge length marked on the test piece. Use of a device that produces a graphical trace throughout the test is preferred.

5.3 Grips, the form of which should prevent any slippage of the test piece during the tensile test. The use of grips with transverse serrations in accordance with Figure 1 is recommended.

Dimensions in millimetres

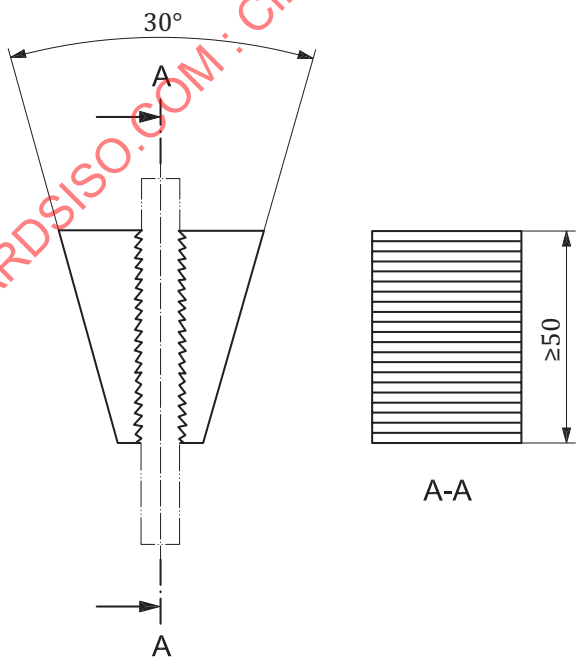


Figure 1 — Grip with transverse serrations

5.4 Die cutter or power saw, either of the dies with wall profiles as shown in Figure 2 being suitable for cutting the test pieces shown in Figure 3, Figure 4, and Figure 5. Other profiles may be used, but the critical feature is that the cut sides of the test piece are perpendicular to the test piece surfaces.

6 Test pieces

6.1 Shape and dimensions

The shape and dimensions of the test piece shall be in accordance with Figure 3, Figure 4, Figure 5, or Figure 6.

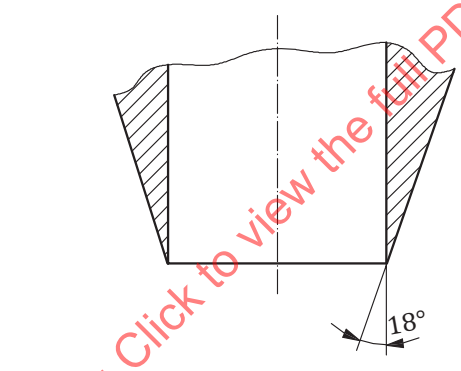
6.2 Method of selection of test pieces

Test pieces shall be selected parallel, or at right angles, to the axis of the belt, and at not less than 50 mm from the edge of the belt. If test pieces are selected from a sample cut from the belt, no test piece shall be cut with its longitudinal edge less than 12 mm from the edge of the sample. In all cases, the cut or sawn sides of the test piece shall be perpendicular to its surface. No test piece shall contain a ply joint.

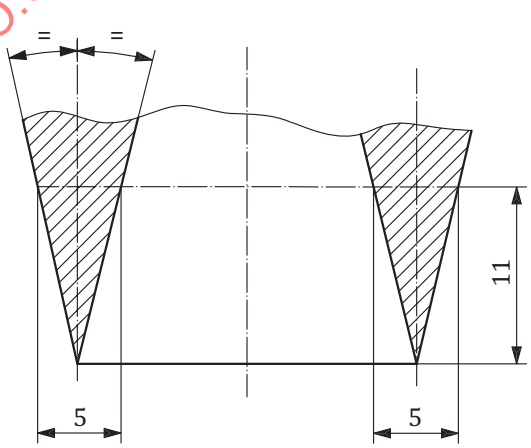
For a test piece of type D, draw the form of the test piece on the surface of the belt or sample and from each edge of the sample, cut at five places with a power saw up to the drawn lines (see Figure 6).

The type D test piece illustrated in Figure 6 should be limited to the testing of conveyor belts having tensile strengths greater than 2 000 N/mm.

Dimensions in millimetres



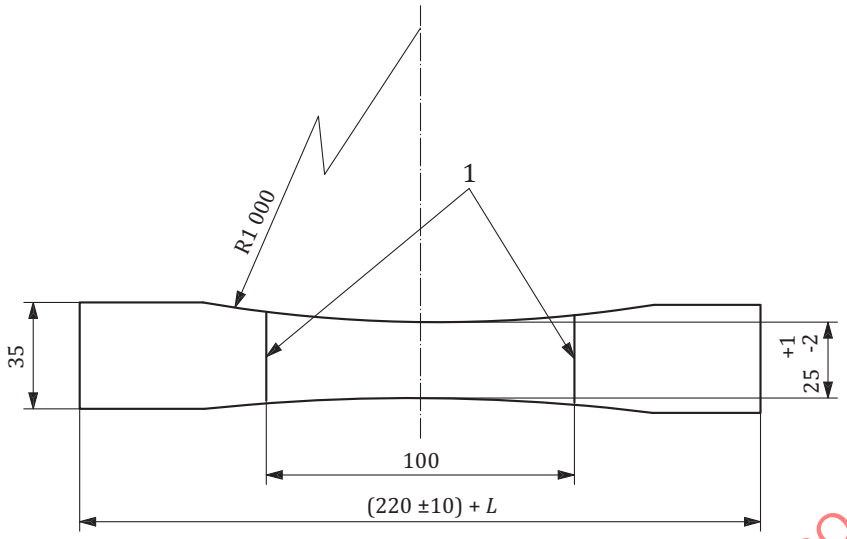
a)



b)

Figure 2 — Suitable die profiles

Dimensions in millimetres



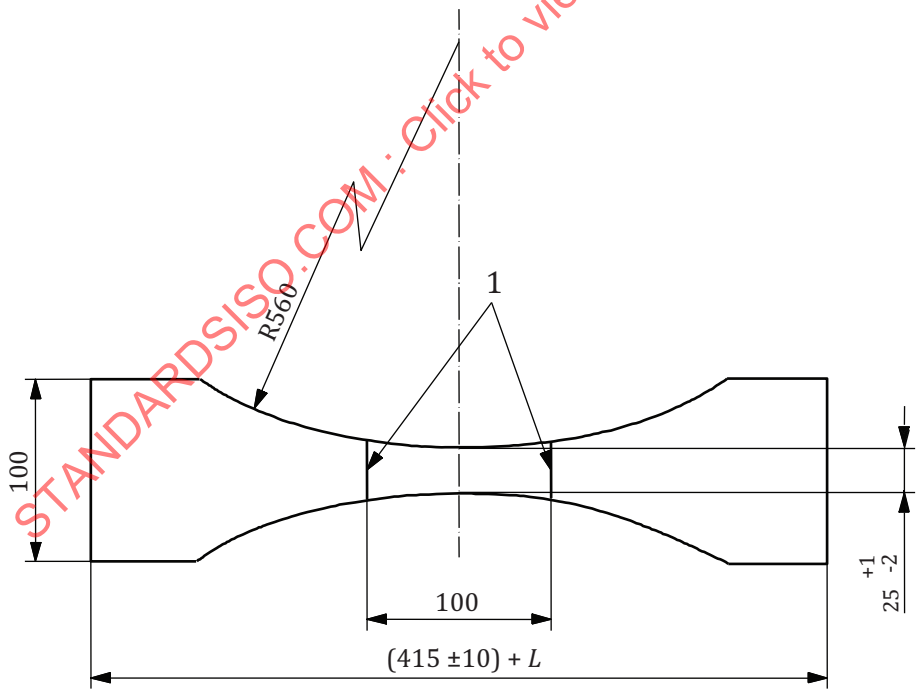
Key

L length of both grips

1 reference lines

Figure 3 — Type A test piece

Dimensions in millimetres



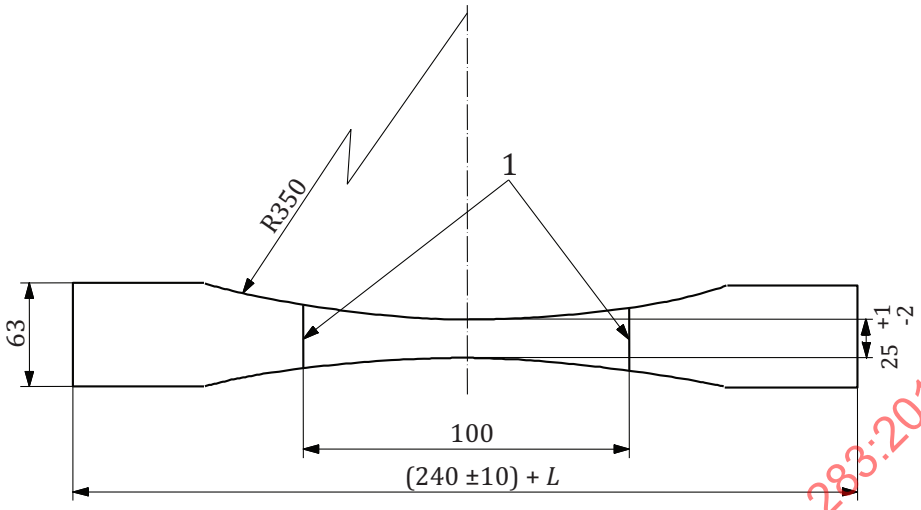
Key

L length of both grips

1 reference lines

Figure 4 — Type B test piece

Dimensions in millimetres



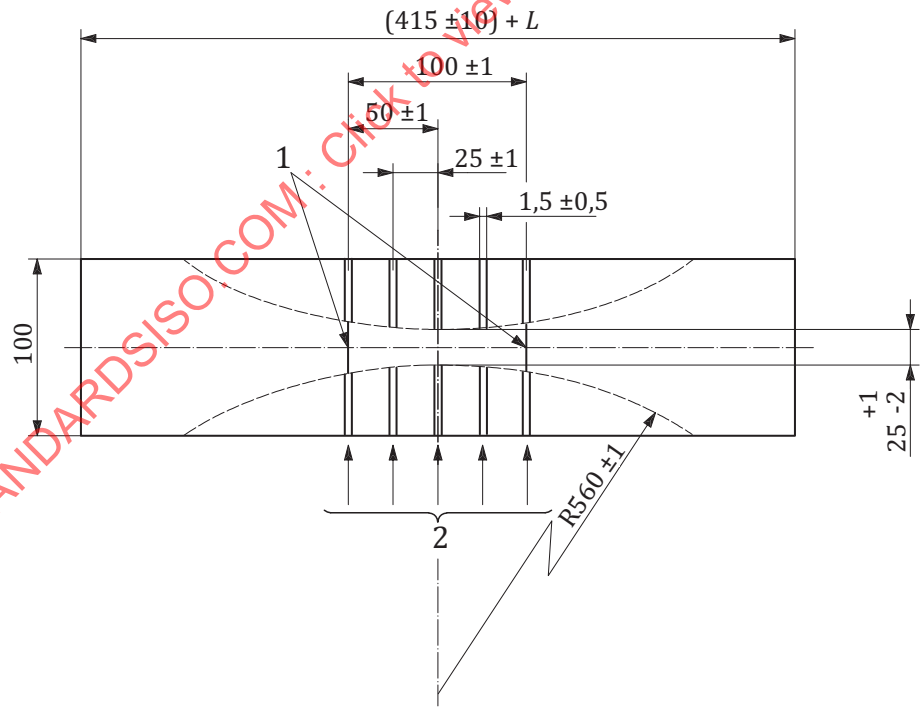
Key

L length of both grips

1 reference lines

Figure 5 — Type C test piece

Dimensions in millimetres



Key

L length of both grips

1 reference lines

2 cutting points across the warp

Figure 6 — Type D test piece

6.3 Preparation of test pieces

Across the longitudinal axis of the test piece and at right angles to it, draw reference lines 100 mm apart and equidistant from the centre of the test piece (see Figure 3, Figure 4, Figure 5, and Figure 6).

Measure the width of the test piece at the centre of the middle section, i.e. between the reference lines, using a vernier gauge capable of reading to at least 0,1 mm.

If the covers of the belt are very thick or of very different thicknesses, the test may be performed without covers or with reduced covers, to avoid slippage of the test piece in the grips.

For certain types of belt construction, the shapes of the test pieces illustrated in Figure 3, Figure 4, Figure 5, and Figure 6 produce abnormal and unequal stress distributions in the threads of the carcass, causing systematic slip in the grips and giving misleading results. Under such circumstances, the test may be conducted using test pieces of a different shape.

6.4 Number of test pieces

Three test pieces shall be selected from the longitudinal direction of the belt and, if appropriate, three shall be selected from the transverse direction of the belt.

6.5 Conditioning of test pieces

Condition the test pieces in accordance with ISO 18573, using atmosphere A, B, or C, and carry out the tests immediately after completion of the conditioning period.

7 Procedure

Mount the test piece symmetrically between the grips of the tensile testing machine, so that the longitudinal axis of the test piece, the centre-line of the grips, and the line of action of the pulling force are coincident. If using an extensometer, fasten the extensometer to the test piece on the reference lines.

The distance between the inside faces of the grips at the commencement of the test shall be the following:

a) for type A test pieces, (220 ± 10) mm;

b) for both types B and D test pieces, (415 ± 10) mm;

c) for type C test pieces, (240 ± 10) mm.

If a preload is applied to the test piece at the start of the test, this shall not exceed 0,5 % of the nominal tensile strength.

Start the machine and extend the test piece at a constant, uninterrupted speed of (100 ± 10) mm/min. If using a test piece taken from the longitudinal direction of the belt, record the increase in gauge length when the reference force (see 3.3) is reached. Continue the test until the force recording device reaches a maximum value or the test piece breaks, or until the first sign of destruction of the carcass is apparent. Record this maximum force and the increase in gauge length at this force.

If the test piece does not break between the reference lines or if the test piece slips in the grips during the test, discard any result so obtained and repeat the test on a fresh (new) test piece.

8 Calculation and expression of results

8.1 Tensile strength

For each test piece, divide the maximum force, in newtons, recorded during the test by the width of the test piece, in millimetres, at the commencement of the test, and record the value in newtons per millimetre. Determine the arithmetic mean from the values so calculated for the three longitudinal test

pieces and, if appropriate, the arithmetic mean of the values so calculated for the three transverse test pieces. In each case, report the result to the nearest newton per millimetre.

8.2 Elongation

8.2.1 Elongation at break

Calculate the percentage elongation at break for each of the three longitudinal test pieces as given in Formula (1):

$$\frac{100\left(L_2 - L_1\right)}{L_1} \tag{1}$$

where

L_1 is the initial gauge length (i.e. the distance between the reference lines);

L_2 is the gauge length at break.

Report the mean value from the three results so obtained to the nearest 1,0 %.

8.2.2 Elongation at reference force (see 3.5)

Calculate the percentage elongation at the reference force for each of the three longitudinal test pieces, as given in Formula (2):

$$\frac{100\left(L_R - L_1\right)}{L_1} \tag{2}$$

where

L_1 is the initial gauge length;

L_R is the gauge length at the reference force.

Report the mean value from the three results so obtained to the nearest 1,0 %.

9 Test report

The test report shall include the following:

a) reference to this International Standard, i.e. ISO 283;

b) identification of the belt tested;

c) type of test piece used;

d) conditioning period (see 6.5);

e) conditioning atmosphere used (A, B, or C);

f) temperature and relative humidity during the test;

g) whether the test was conducted with or without covers;

h) any departure from the standard test requirements;

i) mean tensile strength, in newtons per millimetre (N/mm), in the longitudinal direction;

j) mean tensile strength, in newtons per millimetre (N/mm), in the transverse direction, if appropriate;