INTERNATIONAL STANDARD

ISO 283

Fifth edition
2023-03

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

Reference number
ISO 283:2023(E)

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Published in Switzerland

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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 3, *Conveyor belts,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 188, *Conveyor belts,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition cancels and replaces the fourth edition (ISO 283:2015), which has been technically revised.

The main changes are as follows:

— addition of conditioning period requirement before being sampled in 6.1;

— clarification of sample width measuring point in 6.3;

— addition of cover reduction requirement in the grip areas in 6.3;

— deletion of the humidity requirement in 6.5.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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

1 Scope

This document 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 document does not apply to light conveyor belts as described in ISO 21183-1.

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 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification 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.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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 belt *tensile strength* (3.1)

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

3.3
reference force
reference load
one-tenth of the *nominal tensile strength* (3.2) in the longitudinal direction multiplied by the width of the test piece in millimetres

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

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

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

The usual laboratory apparatus and, in particular, the following shall be used.

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

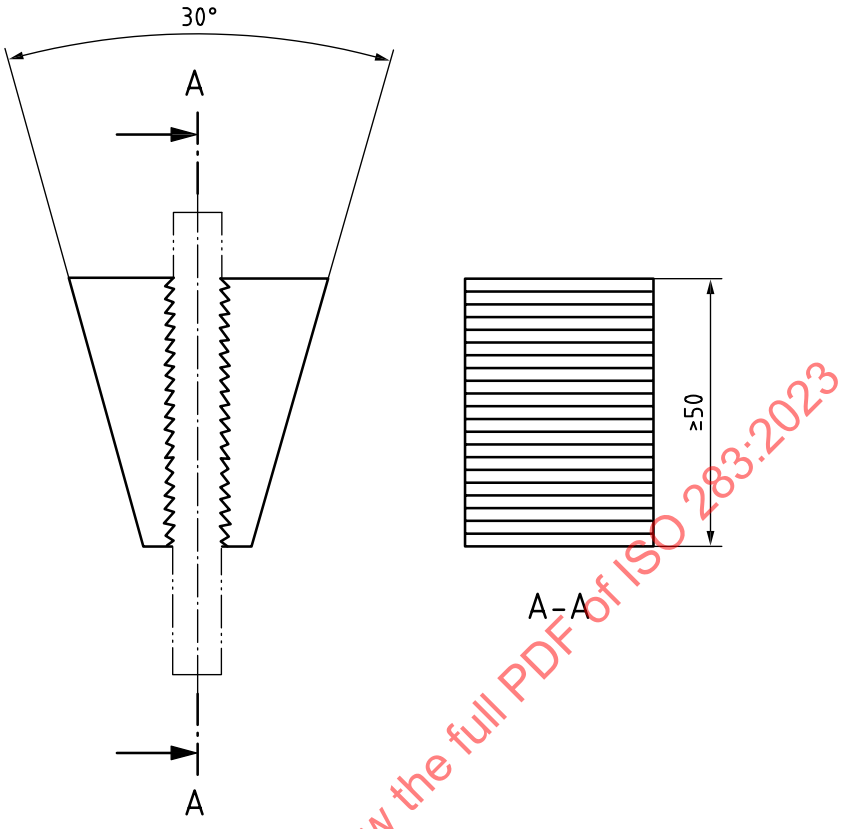


Figure 1 — Grip with transverse serrations

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.

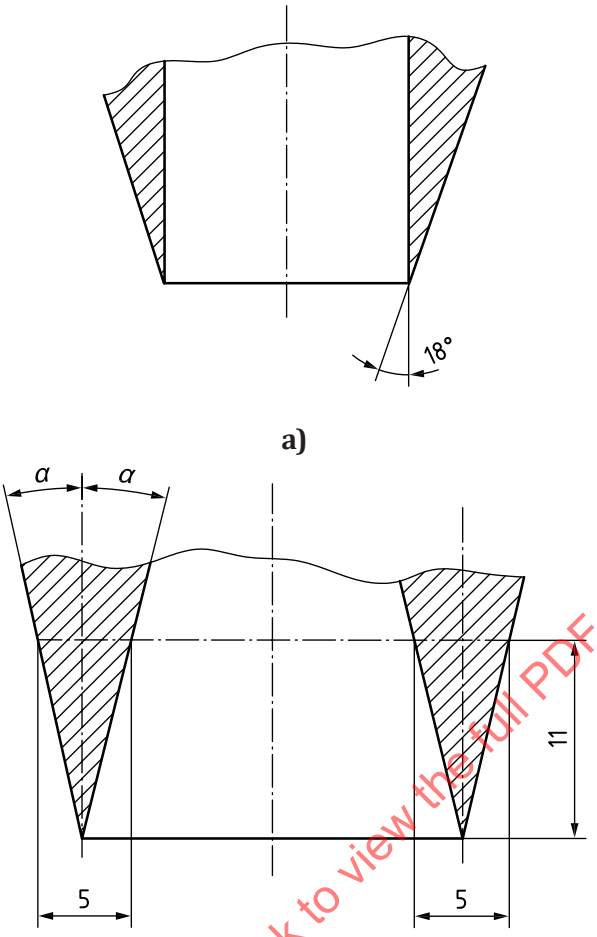
6.2 Method of selection of test pieces

The specimen shall be sampled at least 24 h after manufacture of the belt with any shorter time period to be noted. 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)

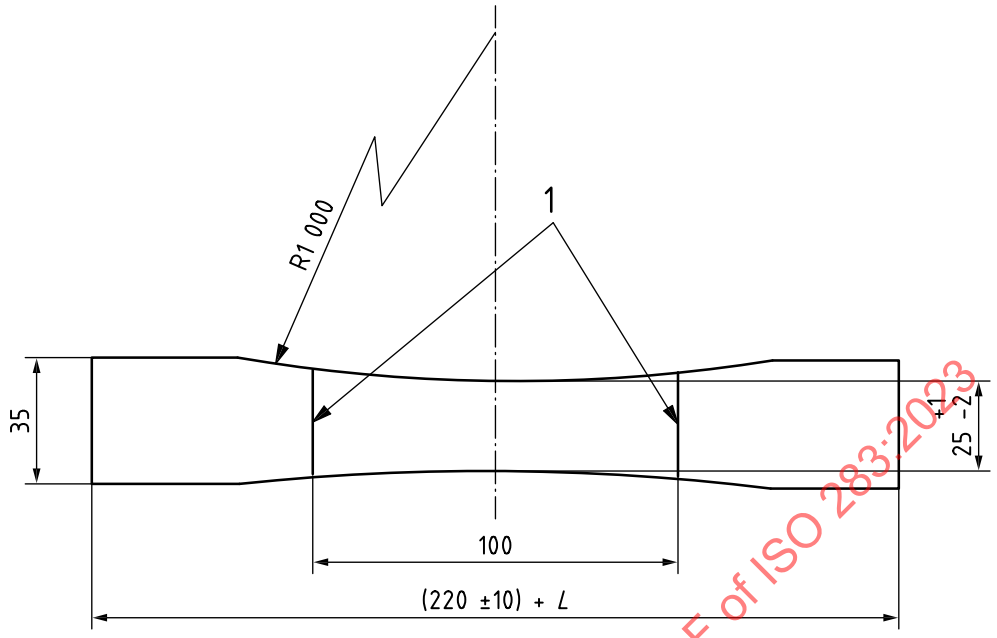
b)

Key

α 1/2 of the cutting-edge angle

Figure 2 — Suitable die profiles

Dimensions in millimetres



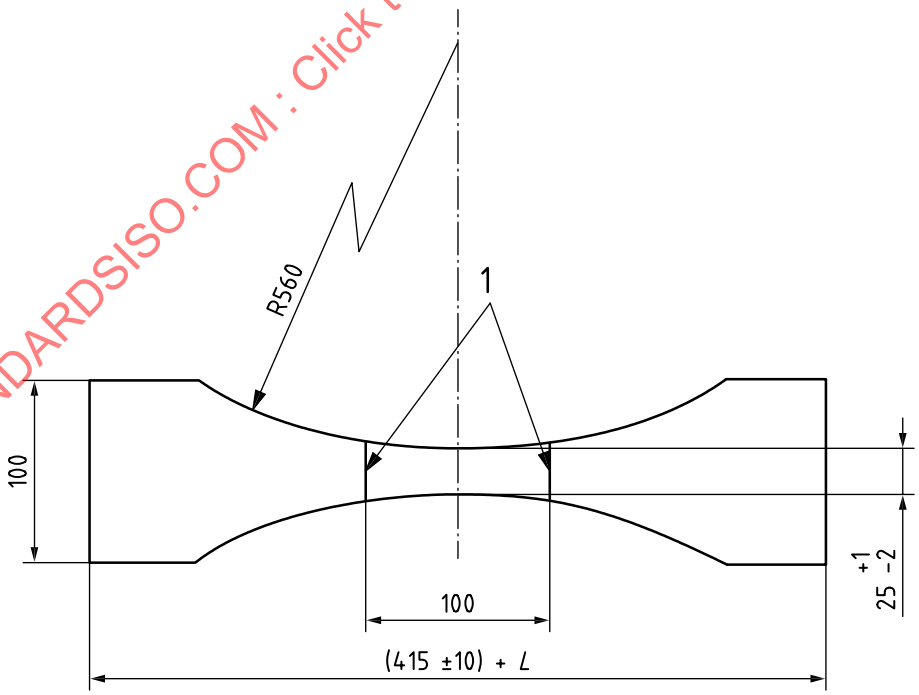
Key

L length of both grips

1 reference lines

Figure 3 — Type A test piece

Dimensions in millimetres



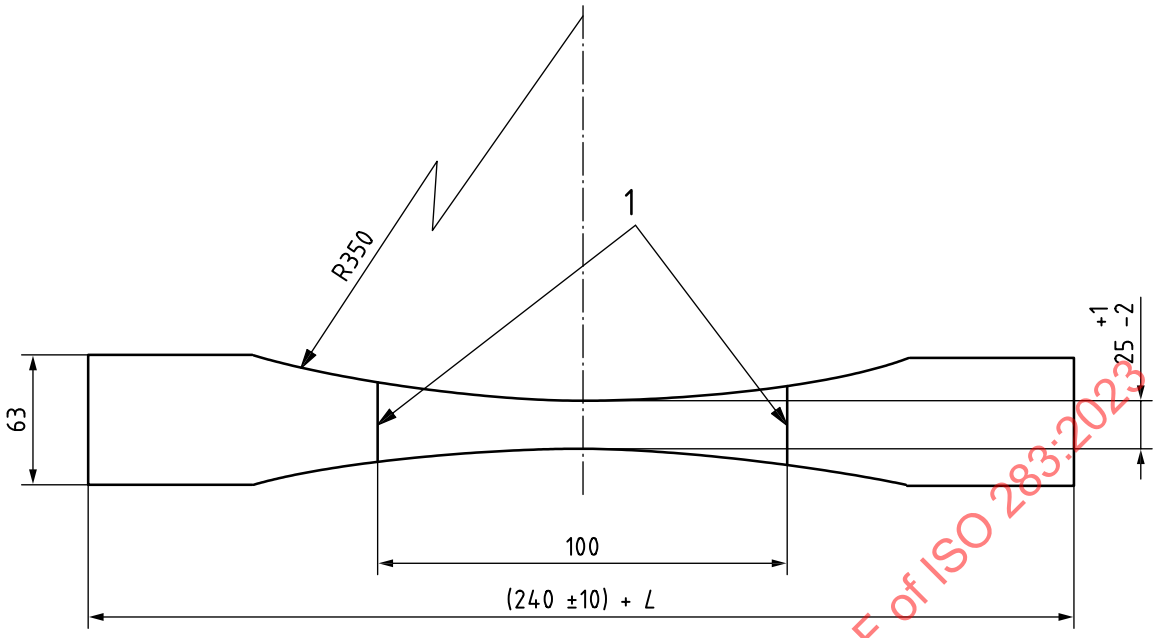
Key

L length of both grips

1 reference lines

Figure 4 — Type B test piece

Dimensions in millimetres



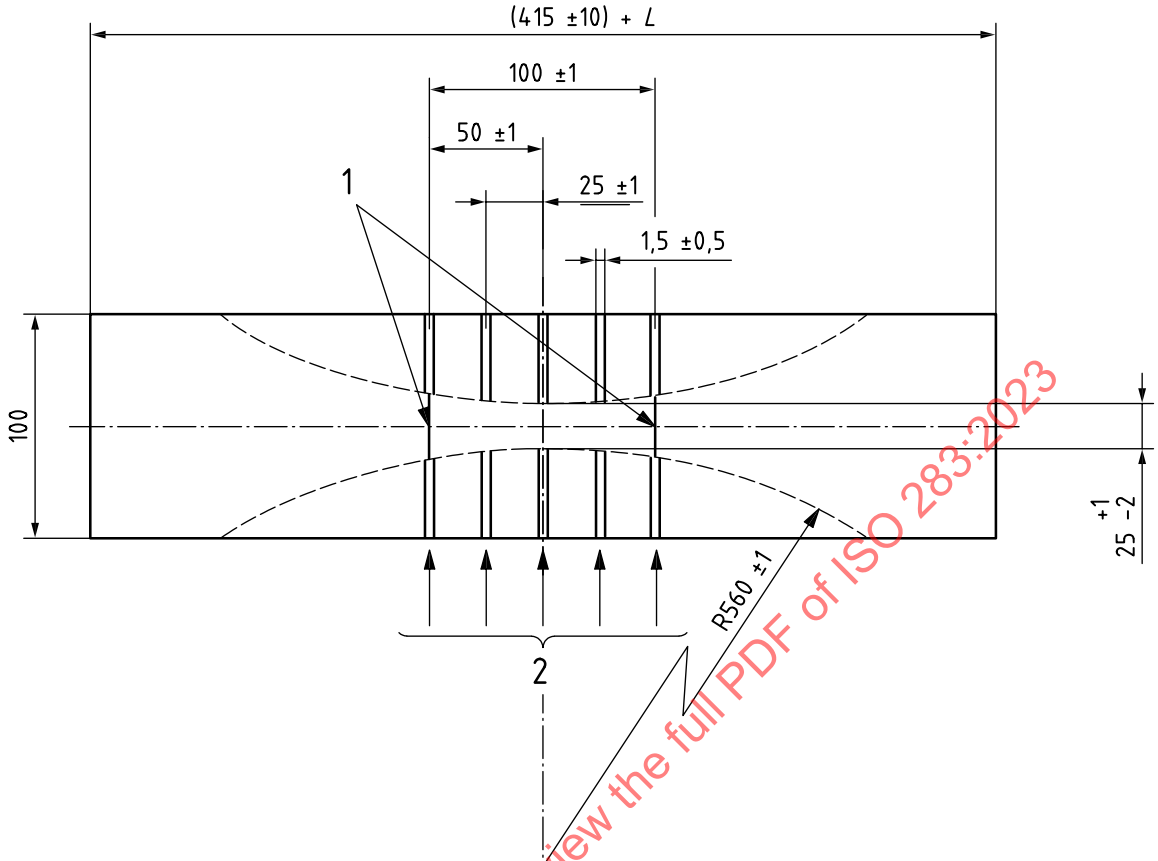
Key

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 or at the centre of the carcass, 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. Covers should be reduced only in the grip areas.

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 other test pieces 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 D or E, 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):

$$\varepsilon_{ab} = \frac{100(L_2 - L_1)}{L_1} \quad (1)$$

where

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

L_2 is the gauge length at break.