

कपड़ा करकस सहित कन्वेयर बेल्ट —  
कुल बेल्ट मोटाई और घटक तत्वों की  
मोटाई — परीक्षण पद्धतियाँ  
( पहला पुनरीक्षण )

Conveyor Belts with a Textile  
Carcass — Total Belt Thickness  
and Thickness of Constructive  
Elements — Methods of Test  
( First Revision )

ICS 53.040.20

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## NATIONAL FOREWORD

This Indian Standard (First Revision) which is identical to ISO 583 : 2023 'Conveyor belts with a textile carcass — Total belt thickness and thickness of constitutive elements — Test methods' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Conveyor Belts Sectional Committee and approval of the Production and General Engineering Division Council.

The carcass is the core of a conveyor belt and is the main load bearing component. The combined fabric reinforcement usually found inside of a conveyor belt is normally referred to as the "Carcass".

The most common carcass design is made up of layers or plies of woven fabrics bonded together. This "conventional plied" belt construction, generally employs a plain weave or twill weave carcass which is built up into as many layers as is required to provide the necessary belt strength, usually bound together with rubber.

This standard was first published in 2018. The present revision has been taken up to align it with ISO 583 : 2023.

In this revision a requirement has been regarding the expression of results (see **4.5**).

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'; and
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current-practice is to use a point (.) as the decimal marker.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

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*Indian Standard*

# CONVEYOR BELTS WITH A TEXTILE CARCASS — TOTAL BELT THICKNESS AND THICKNESS OF CONSTRUCTIVE ELEMENTS — METHODS OF TEST

( *First Revision* )

## 1 Scope

This document specifies test methods for the determination of total belt thickness and the thickness of constitutive elements of conveyor belts having a textile carcass. The constitutive elements include the covers, the carcass and interlayers, i.e. the material between adjoining plies.

This document does not apply to light conveyor belts as described in ISO 21183-1<sup>[1]</sup>.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

No terms and definitions are listed in this document.

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/>

## 4 Determination of total belt thickness

### 4.1 Apparatus

The apparatus shall consist of a flat, rigid baseplate, on which the test piece rests, and a gauge having a flat circular foot, 10 mm in diameter, by means of which a specified pressure is applied to the test piece.

The gauge shall be capable of measuring to at least 0,1 mm.

The pressure applied shall be  $(22 \pm 5)$  kPa for materials with a hardness equal to or greater than 35 IRHD; otherwise, the pressure shall be  $(10 \pm 2)$  kPa.

NOTE The masses needed to give these specified pressures using a 10 mm diameter foot are 176 g and 80 g, respectively.

### 4.2 Test piece

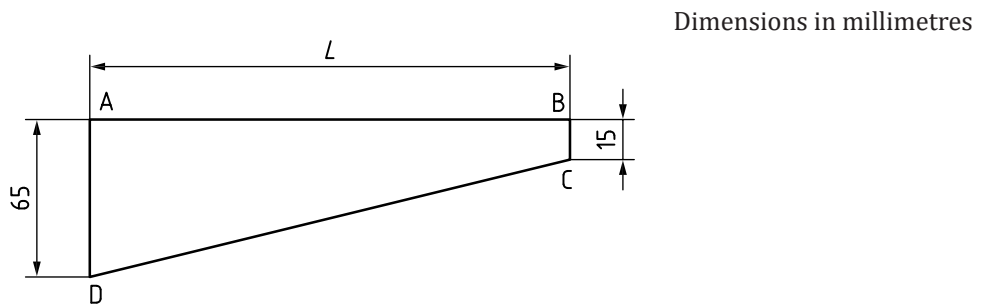
Either test piece 1 or test piece 2, according to the following, shall be used.

**Test piece 1:** cut a rectangular piece of full-width belt, designated as dimension  $L$ , with a length of 50 mm, as shown in [Figure 1](#).



**Figure 1 — Test piece 1 (rectangular)**

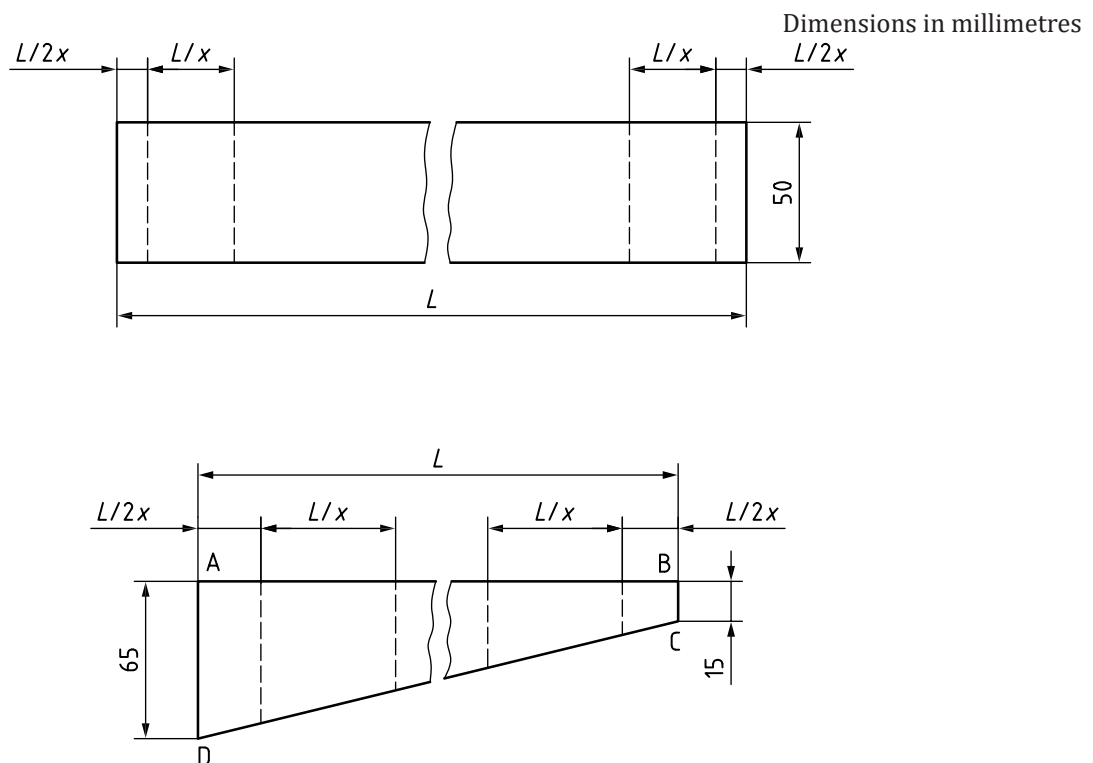
**Test piece 2:** cut a wedge-shaped piece of full-width belt, designated as dimension  $L$ , as shown in [Figure 2](#).



**Figure 2 — Test piece 2 (wedge-shaped)**

### 4.3 Measurement points

The measurement points shall be spaced equidistantly along the long axis of the test piece (i.e. the belt width), as shown in [Figure 3](#).



**Figure 3 — Measurement points**

Determine the minimum number of measurement points,  $x$ , according to the width of the belt,  $L$ , in accordance with [Table 1](#).

**Table 1 — Minimum number of measurement points**

Belt width $L$ mm	Minimum number of measurement points $x$
$L \leq 650$	3
$650 < L \leq 1\ 200$	5
$L > 1\ 200$	8

#### 4.4 Procedure

Measure the total thickness,  $d$ , of the test piece at each of the measurement points specified in [4.3](#), using the pressure specified in [4.1](#).

#### 4.5 Expression of results

Calculate the arithmetic mean and the difference between the maximum thickness and the minimum thickness of the individual measurements taken according to [4.4](#).

Express the arithmetic mean as the total belt thickness in millimetres, to the nearest 0,1 mm.

### 5 Determination of thickness of covers

#### 5.1 General

The thickness of the covers can be obtained by two methods, the choice of one or the other method depends on whether or not the covers can be removed completely from the carcass.

#### 5.2 Method used when covers can be removed completely from carcass

##### 5.2.1 Principle

The thickness of a test piece is measured at a number of points, according to belt width, both before and after each of the covers has been removed. The cover thickness is calculated by subtraction.

##### 5.2.2 Apparatus

The apparatus shall be in accordance with [4.1](#).

##### 5.2.3 Test piece

Test piece 1, in accordance with [4.2](#) and [Figure 1](#), shall be used.

##### 5.2.4 Measurement points

The measurement points shall be in accordance with [4.3](#).

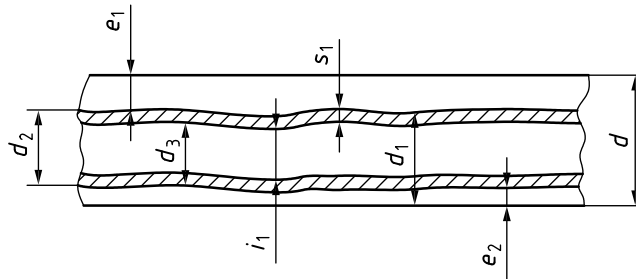
##### 5.2.5 Procedure

Measure the total thickness,  $d$ , of the test piece at each of the measurement points, in accordance with [4.4](#).

Remove the top cover completely, then remeasure the thickness of the test piece,  $d_1$ , at the same measurement points.

Then remove the bottom cover completely and measure the thickness of the test piece,  $d_2$ , at the same measurement points.

See [Figure 4](#).



**Key**

- $d$  total thickness
- $d_1$  thickness of test piece with top cover removed
- $d_2$  thickness of test piece with top and bottom covers removed
- $d_3$  thickness of test piece with one fabric ply removed <sup>a</sup>
- $e_1$  thickness of top cover
- $e_2$  thickness of bottom cover
- $i_1$  thickness of interlayer <sup>a</sup>
- $s_1$  thickness of fabric <sup>a</sup>
- <sup>a</sup> Applicable to belts with two fabric plies (see [7.2.5](#) and [7.2.6](#)).

**Figure 4 — Interlayer thickness (plied fabric belt)**

Protective fabrics embedded in the covers, and which do not form an integral part of the textile carcass, shall be regarded as part of the covers and should be removed with them. Other non-load bearing yarns, which are an integral part of the carcass, shall be regarded as part of the carcass, unless otherwise agreed between manufacturer and purchaser. In the latter case, full details shall be included in the test report.

**5.2.6 Expression of results**

Calculate the thickness,  $e_1$ , of the top cover at each of the measurement points as given in [Formula \(1\)](#):

$$e_1 = d - d_1 \tag{1}$$

Calculate the thickness,  $e_2$ , of the bottom cover at each of the measurement points as given in [Formula \(2\)](#):

$$e_2 = d_1 - d_2 \tag{2}$$

where

- $d$  is the total belt thickness;
- $d_1$  is the thickness of the test piece with the top cover removed;
- $d_2$  is the thickness of the test piece with both top and bottom covers removed.



Calculate the arithmetic mean of the individual measurements and express the cover thicknesses in millimetres, to the nearest 0,1 mm.

### **5.3 Method used when covers cannot be removed completely from carcass**

#### **5.3.1 Principle**

The thickness of each cover is measured directly on a cut edge of unstripped belt by means of an optical micrometer or travelling microscope.

#### **5.3.2 Apparatus**

Optical micrometer or travelling microscope incorporating a scale graduated in divisions of 0,1 mm shall be used.

#### **5.3.3 Test piece**

Cut the test piece in accordance with [4.2](#) (test piece 1 or test piece 2). If the conveyor belt is of solid woven construction, test piece 2 shall be used.

#### **5.3.4 Measurement points**

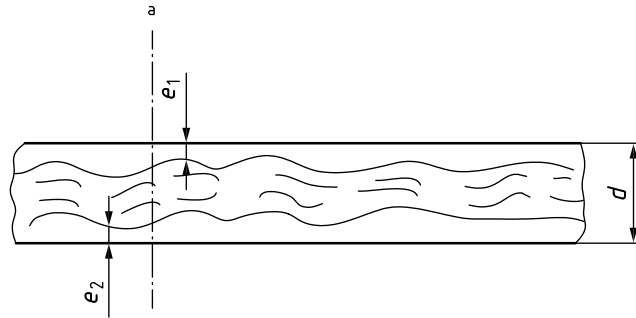
The measurement points shall be in accordance with [4.3](#). If test piece 2 is used, take measurements along line DC shown in [Figure 2](#).

#### **5.3.5 Procedure**

Using the optical micrometer or travelling microscope ([5.3.2](#)), measure the distance between the surface of the belting and the top of the nearest fabric knuckle (see [Figure 5](#)) at each of the measurement points specified in [4.3](#). Ensure that the graduated scale of the optical micrometer or travelling microscope is in physical contact with the test piece to avoid errors of parallax.

With certain colours of cover material, difficulty can be experienced in determining the outline of the fabric knuckles. In these cases, the textile fabric may be identified with a colour stain.

Protective fabrics embedded in the covers, and which do not form an integral part of the textile carcass, shall be regarded as part of the covers and excluded from the measurements. Other non-load bearing yarns, which are an integral part of the carcass, shall be regarded as part of the carcass, unless otherwise agreed between manufacturer and purchaser. In the latter case, full details shall be included in the test report.



**Key**

- $d$  total thickness
- $e_1$  thickness of top cover
- $e_2$  thickness of bottom cover
- <sup>a</sup> Target measurement point.

**Figure 5 — Cover thickness (solid woven belt)**

**5.3.6 Expression of results**

Calculate the arithmetic mean of the individual measurements for each cover and report the result in millimetres, to the nearest 0,1 mm, as  $e_1$ , the thickness of the top cover, and  $e_2$ , the thickness of the bottom cover.

**6 Determination of carcass thickness**

**6.1 Carcass thickness without covers**

For belts where the covers can be removed completely, measure the carcass thickness,  $d_2$ , in accordance with [5.2](#).

**6.2 Carcass thickness with covers**

For belts where the covers cannot be removed, obtain the carcass thickness by subtracting the thickness of both covers, measured in accordance with [5.3](#), from the total belt thickness measured in accordance with [Clause 4](#).

**6.3 Expression of results**

Calculate carcass thickness  $d_2$  at each of the measurement points as given in [Formula \(3\)](#):

$$d_2 = d - (e_1 + e_2) \tag{3}$$

where

- $d$  is the total belt thickness;
- $e_1$  is the thickness of the top cover;
- $e_2$  is the thickness of the bottom cover.

Calculate the arithmetic mean of the individual measurements and express carcass thickness  $d_2$  in millimetres, to the nearest 0,1 mm.

## 7 Determination of thickness of interlayer

### 7.1 General

The thickness of an interlayer (i.e. the elastomeric material between textile fabric layers in a belt of multiply fabric construction) can be obtained using two methods, the choice of one or the other method depends on whether or not the elastomer can be completely separated from the fabric plies.

### 7.2 Method used when elastomeric material in interlayer can be removed completely from adjacent fabric ply

#### 7.2.1 Principle

Thickness measurements are taken at a number of points across the belt width, after the covers have been removed, and again after separation of the fabric and elastomeric layers. The thicknesses of the interlayers are obtained by subtraction.

#### 7.2.2 Apparatus

The apparatus shall be in accordance with [4.1](#).

#### 7.2.3 Test piece

Test piece 1, in accordance with [4.2](#) and [Figure 1](#), shall be used.

#### 7.2.4 Measurement points

The measurement points shall be in accordance with [4.3](#).

#### 7.2.5 Procedure

Measure carcass thickness  $d_2$  of the test piece at each of the measurement points specified in [4.3](#), using the pressure in accordance with [4.1](#).

For belts with two fabric plies, remove one of these fabric plies and measure the thickness of the remaining test piece,  $d_3$ , at the same measurement points (see [Figure 4](#)).

For belts with more than two fabric plies, continue removing fabric and elastomer, taking measurements at the specified points after each operation, until only one layer of fabric and elastomer remains.

#### 7.2.6 Expression of results

For belts with two fabric plies, calculate the thickness of the interlayer,  $i_1$ , at each of the measurement points as given in [Formula \(4\)](#).

$$i_1 = d_2 - (2 \times s_1) \quad (4)$$

where

$d_2$  is the carcass thickness;

$s_1$  is the thickness of the fabric and where

$$s_1 = d_2 - d_3$$

$d_3$  is the thickness of the test piece with one of two plies removed.

For belts with more than two fabric plies, calculate the thickness of each interlayer ( $i_2, i_3, \dots$ ) in a similar manner.

Calculate the arithmetic mean of the individual measurements and express the interlayer thickness,  $i$ , in millimetres, to the nearest 0,1 mm (see [Figure 4](#)).

### **7.3 Method for use when elastomeric material in interlayer cannot be separated completely from adjacent fabric ply**

#### **7.3.1 Principle**

The thickness of an interlayer is measured directly, on a cut edge of unstripped belt, by means of an optical micrometer or travelling microscope.

#### **7.3.2 Apparatus**

An optical micrometer or travelling microscope in accordance with [5.3.2](#) shall be used.

#### **7.3.3 Test piece**

Cut the test piece, either 1 or 2, in accordance with [4.2](#).

#### **7.3.4 Measurement points**

The measurement points shall be in accordance with [4.3](#).

#### **7.3.5 Procedure**

Using the optical micrometer or travelling microscope ([5.3.2](#)), measure the thickness of the interlayer material by measuring the distance between each elastomer/fabric interface for that particular layer. Ensure that the graduated scale of the optical magnifier is in physical contact with the test piece in order to avoid errors of parallax.

Small differences in measurement caused by fabric undulations will be minimized by subsequent averaging of results. However, where the crimp of the fabric is sufficient to cause a significant difference, measurement points should be selected in a similar manner to those described in [4.3](#) to ensure that a minimum interlayer thickness is obtained.

#### **7.3.6 Expression of results**

Calculate the arithmetic mean of the individual measurements for a particular interlayer and report the result in millimetres, to the nearest 0,1 mm, as interlayer thickness  $i_1, i_2, i_3, \dots$ , as appropriate.

## **8 Test report**

The test report shall contain the following information:

- a) reference to this document (i.e. ISO 583:2023);
- b) the identification of the conveyor belt tested;
- c) the number of measurement points;
- d) whether test piece 1 or test piece 2 was used;
- e) the test pressure value (where applicable);
- f) the result expressed in accordance with [4.5](#), [5.2.6](#), [5.3.6](#), [6.3](#), [7.2.6](#) or [7.3.6](#), as appropriate;

- g) any deviations from the procedure;
- h) any unusual features observed;
- i) the date of the test.

## Bibliography

- [1] ISO 21183-1, *Light conveyor belts — Part 1: Principal characteristics and applications*



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