*भारतीय मानक*
***Indian Standard***

**IS 16383 : 2017**
**ISO 21180 : 2013**

# हल्की कन्वेयर बेल्ट — अधिकतम तन्य शक्ति का निर्धारण

# Light Conveyor Belts — Determination of the Maximum Tensile Strength

ICS 53.040.20



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली-110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.org.in www.standardsbis.in

**April 2017** **Price Group 3**

Transmission Devices Sectional Committee, PGD 33

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 21180 : 2013 'Light conveyor belts — Determination of the maximum tensile strength' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Transmission Devices Sectional Committee and approval of the Production and General Engineering Division Council.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminology and 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'.

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.

The technical committee has reviewed the provisions of the following International Standards referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard:

| *International Standard* | *Title* |
|---|---|
| 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 |

*Indian Standard*

# LIGHT CONVEYOR BELTS — DETERMINATION OF THE MAXIMUM TENSILE STRENGTH

## 1 Scope

This International Standard specifies a test method for the determination of the maximum tensile strength of light conveyor belts, according to ISO 21183-1, or of other conveyor belts where ISO 283 is not applicable.

## 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 load**
force per unit of belt width, expressed in newtons per millimetre

Note 1 to entry: In light conveyor belt technology, the definition of tensile load deviates from that commonly used. It is measured in force per unit of belt width, in newtons per millimetre, while normally it is defined as a stress, i.e. a force per unit of cross section, in newtons per square millimetre.

Note 2 to entry: In light conveyor belt technology, the symbol for the tensile load is $k$ and the maximum tensile strength is designated as $k_{max}$, expressed in newtons per millimetre.

Note 3 to entry: In EN 10002-1:2001, the symbol $k$ is used to represent the coefficient of proportionality.

## 4 Symbols

The following symbols are used in this document (see also Figure 1):

$F_{break}$ is the tensile force in the test piece at break, in newtons;

$F_{max}$ is the maximum tensile force in the test piece, in newtons;

$k_{max}$ is the value of $F_{max}$ divided by the width, in millimetres, of the narrowest part of the test piece at the start of the test;

$\Delta l$ is the actual increase in length of the test piece between the jaws, in millimetres, during the test;

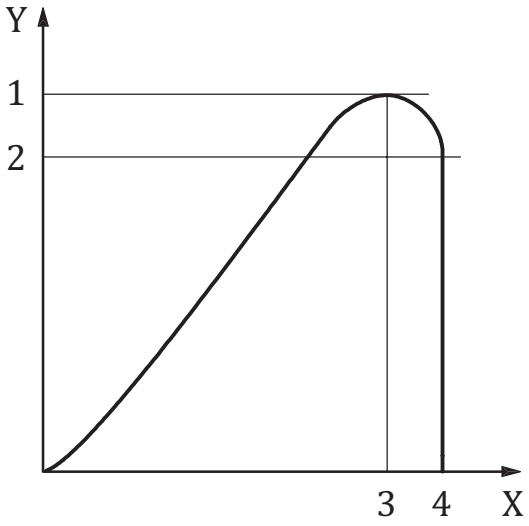
$\Delta l_{break}$ is the increase in length of the test piece between the jaws, in millimetres, taken at $F_{break}$;

$\Delta l_{max}$ is the increase in length of the test piece between the jaws, in millimetres, taken at $F_{max}$;

$\Delta l_m$ is the increase in length of the distance between the datum marks (see 7.4), in millimetres;

$\varepsilon_{max}$ is the value of $\Delta l_{max}$ or $\Delta l_m$ divided by the initial length of the test piece or the initial distance between the datum marks and expressed in percent.

NOTE $F_{max}$ and $F_{break}$ can be the same but are not necessarily so.




**Key**

X elongation of test piece, $\Delta l$ (mm)
Y tensile force, $F$ (N)
1 $F_{max}$
2 $F_{break}$
3 $\Delta l_{max}$
4 $\Delta l_{break}$

**Figure 1 — Dynamometer graph**

# 5 Principle

A test piece, cut from the full thickness of the conveyor belt in the longitudinal direction, is tested and the tensile force recorded as a function of the belt elongation. From that graph, the maximum tensile strength is determined by calculation.

# 6 Apparatus

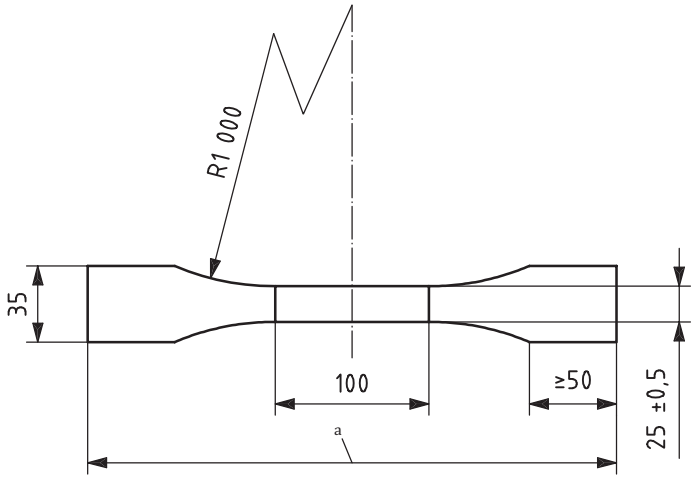
**6.1 Tensile testing machine (dynamometer)**, capable of applying a load suitable for the maximum tensile strength of the test piece and with a force-measuring system, in accordance with ISO 7500-1, class of machine 3 or better (e.g. class of machine 2).

# 7 Test pieces

## 7.1 Shape and dimensions

The test pieces shall be cut from the full thickness of the conveyor belt in the longitudinal direction. Their shape and dimensions shall be in accordance with Figure 2. The test pieces shall not be tested sooner than five days after manufacture.

Dimensions in millimetres




a 220 + (2 × length of a jaw).

**Figure 2 — Shape and dimensions of test piece**

For certain types of belt construction, the shape of the test pieces illustrated in Figure 2 might produce abnormal and unequal stress distributions in the threads, causing systematic slip in the grips, giving misleading results. Under such circumstances, the test may be conducted using test pieces of a different shape (see, for example, ISO 1421 and ISO 13934-1).

## 7.2 Number and selection

Five test pieces shall be taken in the longitudinal direction of the conveyor belt.

The test pieces shall be selected in accordance with Figure 3.

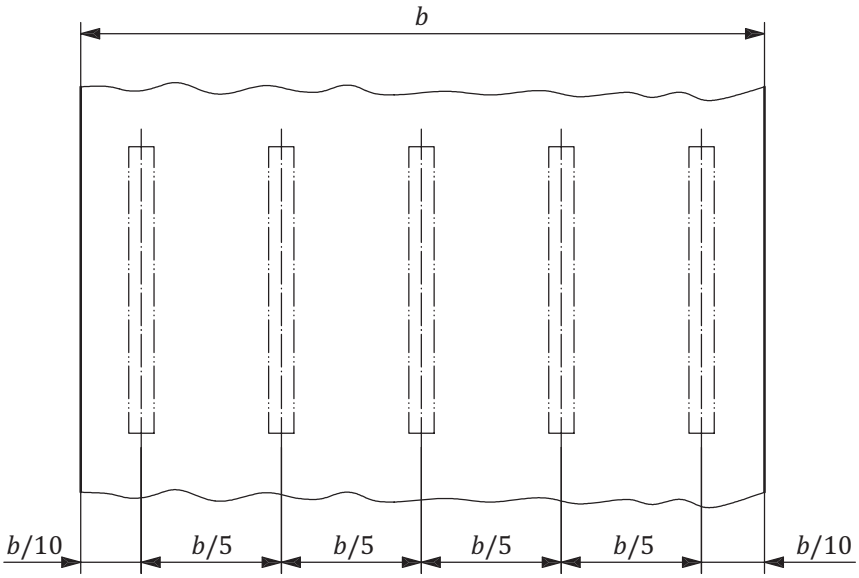



**Figure 3 — Distribution of test piece selection**

### 7.3 Conditioning

Before testing, condition the test pieces in accordance with ISO 18573, Atmosphere B, for 24 h, except that if the light conveyor belt consists of materials with a high absorption of moisture, e.g. cotton or polyamide, condition the test pieces for 48 h.

### 7.4 Preparation

On the longitudinal axis of the test piece, draw two datum marks equidistant from the centre and (100 ± 0,5) mm apart (see Figure 2).

## 8 Procedure

Place the ends of the test piece between the jaws of the tensile testing machine (6.1) such that the test piece is straight without using force. Ensure that the free length between the jaws is 220 mm ± 5 mm and that there is no slippage of the test piece in the jaws during the test.

Slippage can be minimized by rubbing rosin on the portion of the test piece that will be in the jaws, removing any excess rosin and enclosing both sides of the rosin-coated test piece with coarse emery cloth. The emery cloth should be folded over the ends of the test piece with the coarse side of the cloth next to the rosin-coated surfaces.

Exert a continuous (uninterrupted) tensile stress on the test piece, at a rate of (100 ± 10) mm/min.

Record the tensile force as a function of the belt elongation. Continue at least until the maximum tensile force $F_{max}$ is reached or, optionally, until breakage occurs. If testing until breakage occurs, observe whether the break occurs between the two datum marks on the test piece. If any test pieces break outside this central portion or if they slip in the jaws, do not take these results into account when calculating the mean, but repeat the test using new test pieces.

## 9 Calculation and expression of results

Read the maximum tensile force, $F_{max}$, from the graph, as shown in Figure 1.

Divide $F_{max}$ by the smallest width of the test piece (25 mm), thus giving the maximum tensile strength $k_{max}$:

$$k_{max} = \frac{F_{max}}{25\,mm}\ N/mm$$

If required, calculate the elongation $\varepsilon_{max}$ taking place at $F_{max}$ from $\Delta l_m$ (in millimetres) and record it as a percentage as follows:

$$\varepsilon_{max} = \frac{\Delta l_m}{100\,mm} \times 100\,\%$$

If no measuring device for $\Delta l_m$ (in millimetres) is available, $\varepsilon_{max}$ may also be calculated from $\Delta l_{max}$ as follows:

$$\varepsilon_{max} = \frac{\Delta l_{max}}{220\,mm} \times 100\,\%$$

However, this method has the disadvantage of having the result being influenced by the different widths of the test piece (25 mm to 35 mm) and is only correct if there has been no slippage of the test piece in the jaws of the apparatus.

If the test was continued until breakage occurred, $k_{break}$ and $\varepsilon_{break}$ may analogously be determined from $F_{break}$.

Calculate the individual $k_{max}$ values of all five test pieces and take the arithmetical mean of the five values. Use the same procedure for the calculation of $\varepsilon_{max}$, if required. Determine the values for the breaking conditions in the same way, if applicable.

## 10 Test report

The test report shall include the following information:

a) a complete designation of the tested conveyor belt material and the manufacturing date;

b) reference to this International Standard, i.e. ISO 21180;

c) test room temperature and relative humidity;

d) conditioning period;

e) results of the test in accordance with Clause 9;

f) date of the test.

# Bibliography

[1] ISO 283, *Textile conveyor belts — Full thickness tensile strength, elongation at break and elongation at the reference load — Test method*

[2] ISO 1421, *Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break*

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

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

[5] EN 10002-1:2001, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

**Bureau of Indian Standards**

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.



**Review of Indian Standards**

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: PGD 33 (1427).

**Amendments Issued Since Publication**

| Amend No. | Date of Issue | Text Affected |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

BUREAU OF INDIAN STANDARDS

**Headquarters:**

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
*Telephones* : 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.org.in

**Regional Offices:** *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 — 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi, KOLKATA 700054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, CHANDIGARH 160019 — 26 50206, 265 0290

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

**Branches:** AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi