भारतीय मानक
Indian Standard

IS 1891 (Part 4) : 2024

कन्वेयर और एलीवेटर टेक्सटाइल बेल्टिंग — विशिष्टि

भाग 4 हाइजीनिक बेल्टिंग

(दूसरा पुनरीक्षण)

Conveyor and Elevator Textile Belting — Specification

Part 4 Hygienic Belting

(Second Revision)

ICS 53.040.10

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June 2024 **Price Group 7**

Conveyor Belts Sectional Committee, PGD 40

FOREWORD

This Indian Standard (Part 4) (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Conveyor Belts Sectional Committee had been approved by General Engineering Division Council.

This standard covers the requirements for rubberized canvas hygienic conveyor belting intended for handling foodstuffs and other products which require hygienic handling. This standard was first published in 1971 and subsequently revised in 1978.

This revision has been brought out to take care the experience gained since the last publication and to bring it in line with the current manufacturing practices vis-à-vis new technological advancements. SI system of units have been followed in the standard.

In the preparing this standard, assistance has been drawn from ISO 505 : 2017 'Conveyor belts — Method for the determination of the tear propagation resistance of textile conveyor belts'.

This standard has been published in 5 parts.

Other part in this series are:

Part 1	General purpose belting
Part 2	Heat-resistant belting
Part 3	Oil-resistant belting
Part 5	Fire resistant belting for surface application

Requirements of PVC/plastic hygienic belting are covered separately in IS 11842:1986 'Specification for PVC/Plastic hygienic belting'.

The major changes made in this standard as compared to the first revision are:

a) All the amendments issued to the previous version of the standard have been amalgamate and the text of the standard has been suitably modified to make it more user friendly;
b) Introduction to various types of hygiene belting used in food industry along with relevant tests applicable to them have been included;
c) Some new tests like fire resistance, electrical surface resistance test (antistatic test), volume swelling, heat resistance, non-stick test and tear resistance test have been added; and
d) Method of testing tear strength test has been included.

The composition of the Committee, responsible for the formulation of this standard is given in Annex D.

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, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

Indian Standard

CONVEYOR AND ELEVATOR TEXTILE BELTING — SPECIFICATION

PART 4 HYGIENIC BELTING

(Second Revision)

1 SCOPE

This standard (Part 4) covers requirements for rubberized canvas hygienic conveyor belting intended for handling foodstuffs and other products which require hygienic handling.

This standard does not cover PVC/plastic hygienic belting.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY, DIMENSIONS AND TOLERANCES

Terminology, dimensions and tolerances shall be as prescribed in IS 1891 (Part 1).

4 GENERAL

4.1 Types of Belting

There are many different types of belts for different applications which are as follows:

a) Method of loading the product on conveyor — Gradual loading or impact loading;

b) The speed by which the product will be conveyed — Low speed (up to 4 m/s), medium speed (more than 4 m/s and up to 8 m/s), high speed (more than 8 m/s);

c) Direction of travel of product — Horizontal, inclined and decline travel; and

d) The environment in which the conveyor will operate (that is room temperature, hot or cold environment), wet or dry, etc.

4.2 Further based upon application of usage of hygienic belting, following hygiene belts are covered in the standard:

a) Agriculture and harvesting (grains) belts — Characteristics — Non-toxic, antistatic, fire resistant;

b) Oil mill conveyor belts — Characteristics — Non-toxic, oil resistant, fire resistant;

c) Tea conveyor belts — Characteristics — Non-toxic;

d) Sugar conveyor belts — Characteristics — Non-toxic, abrasion resistant, antistatic, fire resistant;

e) Chocolate/candy conveyor belts — Characteristics — Non-toxic, non-stick, resistant to vegetable oils;

f) Bakery conveyor belts — Characteristics — Non-toxic, resistant to high temperature, resistant to vegetable oils;

g) Fruits and vegetables conveyor belts — Characteristics — Non-toxic, tear resistance;

h) Meat and poultry belts — Characteristics — Non-toxic, resistant to animal oils/fats, resistant to microbial formulation; and

j) Fish and seafood processing belts — Characteristics — Non-toxic, resistant to temperature, tear resistance; resistance to animal fats.

5 FABRIC

Fabric shall be as per IS 1891 (Part 1) In case the belts are manufactured from cotton duck, they shall conform to Type 28 or Type 32 of IS 5996.

6 RUBBER COVER — HYGIENIC REQUIREMENT

All the compounding ingredients used in the rubber compound from which the rubber covers are made should be free from harmful ingredients liable to extraction by contact with the foodstuffs and other materials being handled or which may cause the development of undesirable odour, taste or discoloration. The compounding ingredients recommended for this purpose are given in Annex B.

Table 1 Tests Applicable on Various Types of Belts

(*Clause* 8)

Sl No.	Type of Belt	Tensile Strength and Elongation at Break of Rubber Cover	Adhesion	Ageing	Troughability	Heat Resistance	Resistance to Abrasion	Non-Stick Test	Volume Swelling	Electrical Surface Resistance Test	Fire Resistance	Tear Resistance
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(i)	Agriculture and harvesting (grains) belts	×	×	×	×	–	×	–	×	×	×	–
(ii)	Oil mill conveyor belts	×	×	×	×	–	–	–		×	×	–
(iii)	Tea conveyor belts	×	×	×	×	–	–	–	×	–	–	–
(iv)	Sugar conveyor belts	×	×	×	×	–	×	–	–	×	×	–
(v)	Chocolate/candy conveyor belts	×	×	×	×	×	–	×	–	–	–	–
(vi)	Bakery conveyor belts	×	×	×	×	×	–	×	–	–	–	–
(vii)	Fruits and vegetables conveyor belts	×	×	×	×	–	×	–		–	–	×

Table 1 (*Concluded*)

Sl No.	Type of Belt	Tensile Strength and Elongation at Break of Rubber Cover	Adhesion	Ageing	Troughability	Heat Resistance	Resistance to Abrasion	Non-Stick Test	Volume Swelling	Electrical Surface Resistance Test	Fire Resistance	Tear Resistance
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(viii)	Meat and poultry conveying belts	×	×	×	×	–	–	×	×	–	–	×
(ix)	Fish and sea food processing belts	×	×	×	×	–	×	×	×	–	–	×

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– = Applicable, and × = Not applicable

7 CONSTRUCTION

Construction shall be as per prescribed in IS 1891 (Part 1). Hygienic beltings shall be of full width ply construction only.

The surface of the cover on the carrying side of the belt shall be considerably smooth so that particles of the material conveyed will not stick to the belt and cause contamination.

8 TEST REQUIREMENTS OF FINISHED BELTING

The tests specified in **8.1** to **8.10** shall be applicable depending on the type of hygiene belts as given in Table 1.

8.1 Tensile Strength and Elongation at Break of Rubber Cover

When tested as per in Annex B of IS 1891 (Part 1), the tensile strength and elongation at break of the rubber cover shall be as follows:

Tensile strength : 10 MN/m^2 *Min*
Elongation at break : 350 percent, *Min*

8.2 Adhesion

The adhesion between the individual plies and between the cover and the plies shall be such that when tested as per Annex G of IS 1891 (Part 1), the force required to cause separation of the plies shall meet the requirements given in Table 2.

Table 2 Loads for Adhesion Testing

(*Clause* 8.2)

Sl No.	Test	Load, Min kN/m width
(1)	(2)	(3)
i)	Adhesion between individual plies	2.45
ii)	Adhesion between cover and plies:	
	a) Covers up to and including 1.0 mm thick; and	(No test)
	b) Covers over 1.0 mm thick.	2.35

NOTE — No individual value obtained at the time of measurement should be below the values specified above by more than 0.8 kN/m.

8.3 Ageing Test

After ageing for 72 h at (70 ± 1) °C as per IS 3400 (Part 4), the tensile strength and elongation at break of the rubber used for the cover shall not vary by more than $^{+10}_{-25}$ percent and $^{+10}_{-45}$ percent respectively from the corresponding a a a .

8.4 Troughability

Troughability shall be as per IS 1891 (Part 1).

8.5 Heat Resistance

Rubber cover after exposure to a temperature of (100 ± 2) °C for 168 h, the test being carried out as described in IS 3400 (Part 4), the breaking strength, elongation at break of the rubber covers shall not vary from the original unaged values by more than 35 percent and 50 percent respectively.

8.6 Non-Stick Test

The compound to be carried on belt shall not stick on the top surface of the belt. The compliance shall be checked by visual inspection.

8.7 Volume Swelling

The cover of the betting when tested in accordance with IS 3400 (Part 6) shall comply with the following:

a) Test temperature: (27 ± 1) °C;

b) Test liquid: Animal or vegetable oil (as per declaration of actual usage of belt, by supplier);

c) Test Duration: 70 h ± 2 h; and

d) Change in volume percentage: 75 percent *Max*.

8.8 Electrical Surface Resistance Test (Antistatic Test)

The belt shall be tested for antistatic properties. Belt when tested in accordance with Annex C, the electrical resistance of each of the averages shall not exceed 300 MΩ.

8.9 Fire Resistance

8.9.1 *Drum Friction Test*

The belt when tested in accordance with Annex A of IS 1891 (Part 5) shall show no sign of flame, spark or glow.

The drum temperature shall not exceed 325 °C and belting shall part within the 3 h test period.

The drum friction test shall be carried for the purpose of approval of new belt construction. Frequency of this test for supplies of an approved belt construction may be as agreed to between the manufacturer and the purchaser.

This test shall be considered as type test.

8.9.2 *Flame Test*

For each set of four samples, when tested in accordance with Annex B of IS 1891 (Part 5), the average duration of the flame shall not exceed 40 s and the average duration of glow shall not exceed 120 s.

8.10 Tear Strength

Belt shall be tested for tear propagation resistance test as described in Annex C. The Tear propagation resistance shall be as agreed between manufacturer and purchaser.

9 PACKING

The belting shall be packed as mutually agreed to between the purchaser and the manufacturer.

10 MARKING

The belting shall be marked as follows at the intervals of 5 m to 10 m on the carrying surface:

a) The symbol ‘A' to denote hygienic quality of the belting;

b) Type of usage (Bakery conveyor belt/sugar conveyor belt) , etc;

c) The last two digits of the year of the manufacture;

d) Letters or trade-mark identifying the manufacturer; and

e) The number of this standard.

10.1 BIS Certification Marking

The products(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provision of the *Bureau of Indian Standard Act*, 2016 and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

11 SAMPLING AND INFORMATION TO BE SUPPLIED BY THE PURCHASER WITH ENQUIRY OR ORDER

Shall be as per in IS 1891 (Part 1).

12 OTHER REQUIREMENTS

Any other requirement not specifically mentioned in this standard shall be as laid down in IS 1891 (Part 1).

ANNEX A

(*Clause 2*)

LIST OF REFERRED STANDARDS

IS/Other Standards	*Title*
IS 335 : 2018	New insulating oils — Specification (*fifth revision*)
IS 505 : 1995	Light kaolin — Specification (*third revision*)
IS 1675 : 1971	Specification for stearic acid, technical (*first revision*)
IS 1683 : 1994	Barytes for rubber industry specification (*second revision*)
IS 1685 : 1975	Specification for whiting for rubber industry (*first revision*)
IS 1891 (Part 1) : 2021	Conveyor and elevator textile belting — Specification: Part 1 General purpose belting (*fifth revision*)
IS 1891 (Part 5) : 1993	Conveyor and elevator textile belting — Specification: Part 5 Fire resistant belting for surface application
IS 3400 (Part 4) : 2012/ ISO 188 : 2011	Methods of test for vulcanized rubber: Part 4 Accelerated ageing and heat resistance (*third revision*)
IS 3400 (Part 6) : 2018/ ISO 1817 : 2015	Methods of test for vulcanized rubbers: Part 6 Determination of the effect of liquids (*fourth revision*)
IS 5996 : 1984	Specification for cotton belting ducks (*second revision*)
ISO 6133 : 2015	Rubber and plastics — Analysis of multi-peak traces obtained in determinations of tear strength and adhesion strength

ANNEX B

(*Clause* 6)

RECOMMENDED COMPOUNDING INGREDIENTS

B-1 GENERAL

In giving the following data, it is not intended to imply, that the use of alternative materials may not give belts of a suitable quality. The recommendations are, in every case, intended mainly to indicate types of materials which have been found, by practical experience, to be suitable for producing belts to be used for conveying foodstuffs.

B-2 COMPOUNDING

B-2.1 The belts may be made from natural rubber, or some suitable synthetic non-toxic elastomer or a blend of the two together with the necessary compounding ingredients.

B-2.2 All the compounding ingredients used in the rubber shall be free from harmful materials liable to extraction by contact with foodstuffs or which may cause the development of undesirable odour, taste or discolouration.

NOTE — In the case of natural rubber belts, light coloured crape of natural rubber that has been rendered suitable for extrusion (superior processing rubber), or air-dried plantation rubber that is free from p-nitrophenol (so called air-dried sheets), and in the case of synthetic rubber belts, cis-1, 4-polyisoprene, polybutadiene, styrene-butadiene copolymers, nitrile-butadlene copolymers or chioroprene rubber (polychloroprene), or a blend of any of these, may be used as raw material. Divinyl benzene may be used as third polymerization component.

B-3 ACCELERATORS

Recommended accelerators of the tasteless type to suit the requirements specified in **B-2** are thiuram disulphides or monosulphides, dithiocarbamates and suitable polyamines.

B-4 ANTIOXIDANTS

Where it is considered that an antioxidant be employed, the following materials are recommended:

a) Condensation products of acetone and aniline; and

b) Di-βnaphthyl- ρ phenylenedlamlne (symmetric).

B-5 FILLERS

The following fillers are recommended:

a) China clay — China clay should be as per IS 505;

b) Barytes — Barytes should be as per IS 1683;

c) Blanc fixe;

d) Kieselguhr;

e) Silica;

f) Whiting — Whiting shall be as per IS 1685; and

g) Carbon black.

B-6 SOFTENERS

The following softeners are recommended:

a) Stearic acid — Stearic acid shall be as per IS 1675;

b) Petroleum jelly; and

c) Light coloured mineral oil — An example of light coloured mineral oil is transformer oil which shall be as per IS 335.

ANNEX C

(*Clauses* 8.8 *and* 8.10)

METHOD OF DETERMINING TEAR PROPAGATION RESISTANCE

C-1 PRINCIPLE

The test consists in measuring, by means of tensile testing at a given speed, the force necessary to propagate an initial tear made in a test piece.

C-2 APPARATUS

The apparatus consists of a dynamometric tensile testing machine with the following essential characteristics:

a) The machine shall be so chosen that the forces to be measured come within the upper 90 percent range of its full rated capacity;
b) The speed of separation of the jaws shall be capable of being adjusted to 50 mm/min ± 10 mm/min; and
c) The free distance between the jaws shall be capable of being adjusted to at least 300 mm.

The machine shall be provided with a device for the graphical recording of the force necessary to continue tearing the test piece.

C-3 TEST PIECES

C-3.1 Method of Sampling

Test pieces shall be taken from the sample in the longitudinal direction of the belt and at a minimum distance of 50 mm from the edges of the belt.

C-3.2 Shape and Dimensions

Shape and dimension of test pieces shall be as follows:

a) Shape: Rectangular;
b) Length: 300 mm;
c) Width: 100 mm ± 1 mm; and
d) Thickness: Full belt thickness or without covers.

If it is found that weft threads are pulled out of the test piece instead of breaking, the width of the test piece should be increased to 300 mm.

C-3.3 Preparation

Where the test is to be conducted without covers, the covers of the test pieces shall be removed by stripping or by buffing.

If there is a breaker ply, strip the corresponding covers without cutting the breaker ply over a width of 20 mm only that is, 10 mm on each side of the longitudinal axis of the test piece with the exception of the zone held in the jaws of the machine (*see* Fig. 1).

C-4 METHOD OF TEST

C-4.1 Conditioning of Test Pieces

The tests shall start not less than 24 h after manufacturing. This time includes 8 h for conditioning. The conditioning atmosphere shall be one or another of the following:

a) Temperature (20 ± 2) °C with (65 ± 5) percent relative humidity;
b) Temperature (23 ± 2) °C and (50 ± 5) percent relative humidity; and
c) Temperature (27 ± 2) °C and (65 ± 5) percent relative humidity.

The tests shall be conducted in the same atmosphere as used for conditioning.

The atmosphere at which the test pieces are conditioned and tested shall be given in the test report.

In the event of any dispute, regarding the period of conditioning, shall be 72 h.

C-4.2 Test Conditions

The test conditions with regard to temperature and humidity shall be those adopted in **C-4.1**.

C-4.3 Procedure

Mount the two cut ends of the test piece in the jaws of the tensile testing machine either in sense A or in sense B (*see* Fig. 4), so that the inner edges of the cut are situated at the centre of each jaw.

Fix the speed of separation of the jaws at (50 ± 10) mm/min and continue testing until the tear has extended for at least 100 mm.

Record the tearing forces over the length of the tear by means of a graphical device.

C-4.4 Expression of Results

C-4.4.1 Examination and analysis of the multi-peak tear resistance test traces shall be in accordance with ISO 6133.

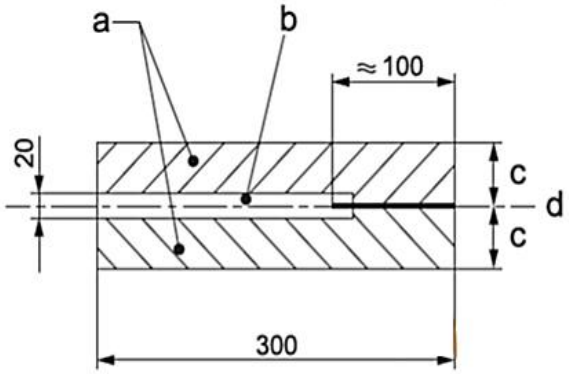
The median peak force is defined as the mean tear resistance.
Indicate the resistance of each test piece separately and then indicate the mean value of the resistance of the two test pieces.

C-4.4.2 *Number* — Two test pieces shall be used: one in sense 'A' and the other in sense 'B' (*see* Fig. 4).

C-4.5 Test Report

The test report shall refer to this standard and shall include the following:

a) Identification of the belt tested;
b) The temperature and relative humidity adopted for the conditioning of the test pieces and the tests;
c) The results expressed in accordance with C-4.4;
d) Whether the test was conducted with or without covers; and
e) An account of any test or operating conditions not specified in this document.

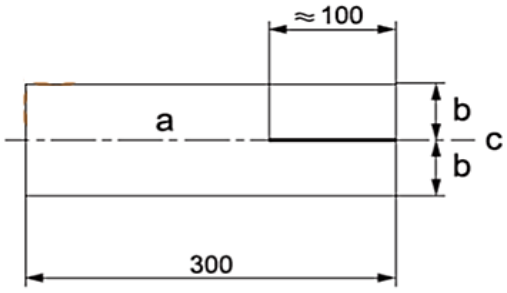


Key
a = with covers
b = covers removed
c = 50 or 150
d = cut line

All Dimensions are in millimetres.

FIG. 1 TEST PIECES WITH BREAKER

Cut the test pieces from the middle of one of their ends over a length of about 100 mm parallel to the length (*see* Fig. 2).

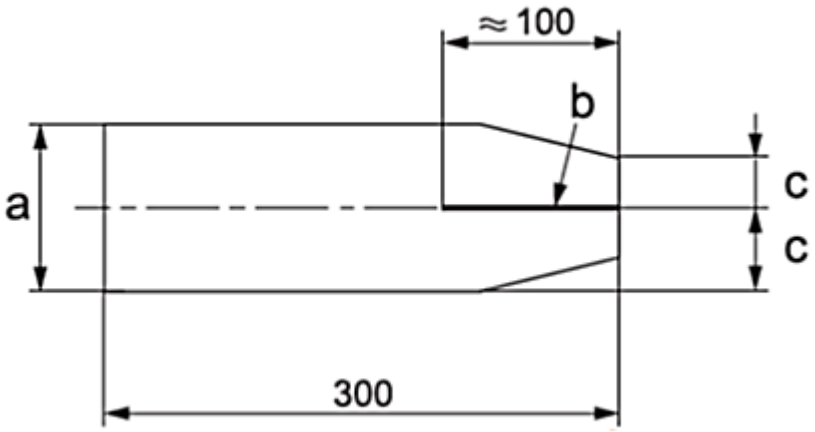


Key
a = without covers
b = 50 or 150
c = cut line

All Dimensions are in millimetres.

FIG. 2 TEST PIECES WITHOUT BREAKER

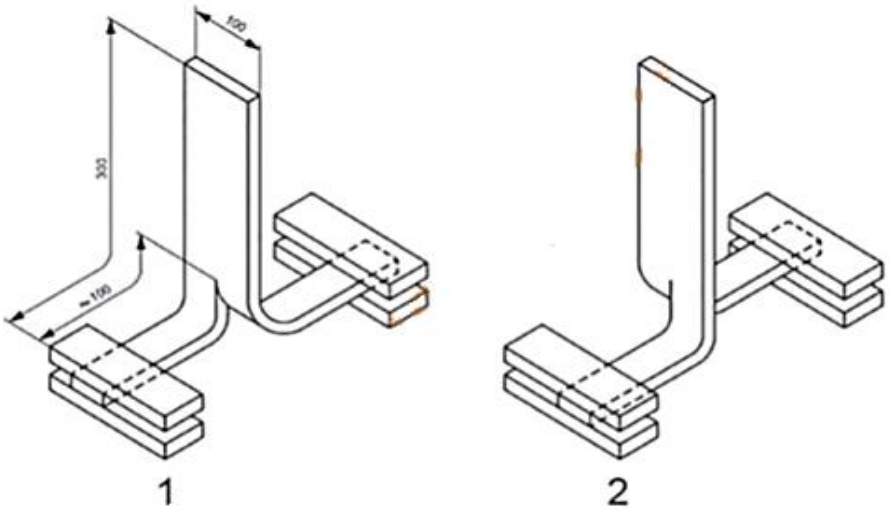
If necessary, the width of the test piece (cut-edge) may be adjusted to the gripping width of the jaws by tapering the edges symmetrically on a length at most the same as that of the cut (*see* Fig. 3), with the width at the end of the cut part as wide as the width of the jaws permits.



Key
a = 300 or 100
b = cut line

All Dimensions are in millimetres.

FIG. 3 TAPERED TEST PIECE



Key

1 sense A
2 sense B

All Dimensions are in millimetres.

FIG. 4 MOUNTING OF TWO CUT ENDS OF TEST PIECE

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Conveyor Belts Sectional Committee, PGD 40

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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 website-www.bis.gov.in or www.standardsbis.in.

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