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भारतीय मानक मसौदा

कन्वेयर और एलिवेटर टेक्सटाइल बेल्टिंग — विशिष्टि : भाग 5 सतह पर प्रयोग के लिए आग प्रतिरोधी बेल्टिंग

(IS 1891-5 *का पहला पुनरीक्षण*)

Draft Indian Standard

Conveyor and Elevator Textile Belting — Specification Part 5 Fire Resistant Belting for Surface Application

(*First Revision of* IS 1891-5)

ICS 53.040.10

Conveyor Belts Sectional Committee, PGD 40	Last Date for Comments: 01-04-2024

FOREWORD

(*Formal clause to be added later on*)

Fire-resistant belting for surface applications plays a critical role in ensuring the safety and operational efficiency of various industries, particularly those prone to fire hazards. This type of belting is designed to withstand high temperatures, flames, and other fire-related risks, making it an essential component in environments where fire safety is paramount.

Fire Resistant Grades	Characteristics
Fire Resistant Grade (FR - K)	The belt (with cover rubbers intact) to comply flammability test along with other fire-resistant properties
Fire Resistant Grade (FR - S)	The belt (with cover rubbers intact) to comply flammability test along with other fire-resistant properties plus the belt to pass flammability requirements without cover rubber present in the belt (belt carcass to pass flammability test)

This Indian Standard was first published in 1993. This first revision has been taken up to keep pace with the latest technological developments and international practices.

In preparation of this standard, assistance has been derived from CAN/CSA – M 422 – M 87 ‘Fire — Performance and anti-static requirements for conveyor belting’ Canadian Standards Association and IS0 340 : 1988 ‘Conveyor belts - Flame retardation — Specification and test method’ International Organisation for Standardization.

This standard is particularly applicable for conveying fiery materials like coal or there is a previous history of fire. It is experienced that fire had taken place even after using fire-resistant belts. In those high fire risk applications, it is observed that one of the causes of that fire is the higher flammability

of the belt when the cover of the belt has been removed. To address a similar situation a new grade/type of fire-resistant belt has been introduced to maintain the flammability properties of the belt without cover rubber present in the belt.

This Standard is published in five parts. The other parts in this series are:

Part 1 General purpose belting
Part 2 Heat resistant belting
Part 3 Oil-resistant belting
Part 4 Hygienic belting

The major changes made in this standard as compared to the previous version are:

a) Introduction to various types of heat resistant belting used in food industry along with relevant tests applicable to them have been included;

b) Some new tests ,such as, fire resistance, electrical surface resistance test (antistatic test), volume swelling, heat resistance, non-stick test and tear resistance test have been added; and

c) Method of testing tear strength test has been added.

In preparation of this standard, assistance has been derived from CAN/CSA – M 422 – M 87 'Fire — Performance and anti-static requirements for conveyor belting' Canadian Standards Association and IS0 340 : 1988 'Conveyor belts - Flame retardation — Specification and test method' International Organisation for Standardization.

The committee responsible for formulation of this standard is listed 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 or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).'

Draft Indian Standard

Conveyor and Elevator Textile Belting — Specification Part 5 Fire Resistant Belting for Surface Application

(*Third Revision of* IS 1891-5)

1 SCOPE

This standard IS 1891 (Part 5) specifies the requirements of conveyor and elevator textile belting with antistatic rubber and /or PVC conveyors for the surface application, flat or troughed idlers, where there is an element of fire risk present.

2 REFERENCES

The following standards 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 parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

IS No.	*Title*
IS 1891 (Part 1)	Conveyor and elevator textile belting — Specification: Part 1 General purpose belting (*fourth revision*)
IS 3400 (Part 1)	Method of test for vulcanized rubber — Tensile Stress
IS 3400 (Part 2)	Methods of test for vulcanized rubbers: Part 2 Hardness (*first revision*)
IS 3400 (Part 3)	Methods of test for vulcanized rubbers: Part 3 Abrasion resistance using a rotating cylindrical drum device (*first revision*)
IS 3400 (Part 4)	Methods of test for vulcanized rubbers: Part 4 Accelerated ageing (*first revision*)
ISO 65	Carbon steel tubes suitable for screwing in accordance
ISO 284	Conveyor belts — Electrical conductivity — Specification and test methods
ISO 340	Conveyor belts — Laboratory-scale flammability characteristics — Requirements and test methods
ISO 9329-1	Seamless steel tubes for pressure purposes — Technical delivery conditions Part 1: Unalloyed steels with specified room temperature properties
ISO 9330-1	Welded steel tubes for pressure purposes — Technical delivery conditions Part 1: Unalloyed steel tubes with specified room temperature properties
ISO 18573	Conveyor belt test atmospheres and conditioning periods
ISO 20238	Conveyor belts — Drum friction testing

3 TERMS AND DEFINITIONS

For the purpose of this standard, following terms and definitions given below shall apply.

3.1 After Flame — A flame which persists after the ignition source has been removed.

3.2 After Glow — Persistence of glowing, after cessation of flaming or, if no flaming occurs, after the ignition source has been removed.

3.3 Flame Noun — Zone of combustion in the gaseous phase usually with the emission of light.

3.4 Flame Verb — To undergo combustion in the gaseous phase with the emission of light.

3.5 Glowing — Made luminous by heat, (without flame).

4 TEST REQUIREMENTS OF FINISHED BELTING

Table 4 — Classification of Conveyor Belt Rubber Cover

SL. No	Cover class	Minimum tensile strength of rubber cover N/mm^2	Minimum elongation at break %	Maximum abrasion loss in relative volume mm^3
(1)	(2)	(3)	(4)	(5)
i)	L	15	350	200
ii)	V	17	350	175
iii)	Test method	IS 3400 Part 1 / ISO 37	IS 3400 Part 1 / ISO 37	IS 3400 (Part 3) / ISO 4649 : 2002, Method A

NOTE — These values will help to determine the appropriate cover compound for the application of the materials carried. Other values, such as tear resistance, may be considered if required. Reliable assessment of the behavior of the covers in service for wear and cut resistance cannot be determined from tensile strength, elongation and abrasion values alone. The cover grades L and V are most popular in the Indian scenario.

If other cover materials or qualities are required for a particular application (e.g. safety, oil resistance or heat resistance), the cover properties need to be agreed upon between the purchaser and the manufacturer.

5 FIRE RESISTANCE SAFETY PERFORMANCE REQUIREMENTS

5.1 Electrical Surface Resistance (Anti Static Test) — When tested in accordance with Annex A, all fire-resistant conveyor belts shall have an electrical surface resistance not greater than 300 MΩ.

5.2 Flammability Test — The test shall be carried out as per Annex B.

5.3 Fire Resistant grade FR–K — With covers intact, the sum of the periods of flame for each of the series of six tests (three in warp and three in weft) shall be less than 45 s and no individual value shall be greater than 15 s and no flame re-appearance after application of air current

5.4 Fire Resistant grade FR-S — With covers intact, the sum of the periods of flame for each of the series of six tests (three in warp and three in weft) shall be less than 45 s and no individual value shall be greater than 15 s and no flame re-appearance after application of air current Additional, Without covers, the sum of the periods of flame for each of the series of six tests (three in warp and three in weft) shall be less than 45 s and no individual value shall be greater than 15 s and no flame reappearance shall

happen after application of air current.

5.5 Drum Friction Test — When tested in accordance with Annex C, four samples are to be tested under still and moving air. For each case, the top and bottom cover shall hug the drum at 180^0 arc of contact under the fixed load of 343 N. The drum temperature shall not exceed 400^0 C and there should not be any sign of flame (spark and glow are acceptable). The belt shall part within 1 h of the test.

5.6 Fire Safety Performance Summery

Sr. No	Fire Resistant Grades	Antistatic Test	Flammabiliy Test	Drum Friction
1.	FR – K	≤ 300 MΩ on both surfaces	With covers intact, the sum of the periods of flame for each of the series of six tests (three in warp and three in weft) shall be less than 45s and no individual value shall be greater than 15s and no flame re-appearance after application of air current.	Drum temperature shall not exceed 400^0 C and there shall not be any sign of flame. In each case total four samples to be tested, in two cases bottom cover facing drum and in another two cases top side facing the drum. In both cases test to be carried out as per Method A and Method B.

2	FR – S	≤ 300 MΩ on both surfaces	With covers intact, the sum of the periods of flame for each of the series of six tests(three in warp and three in weft) shall be less than 45 s and no individual value shall be greater than 15 s and no flame re-appearance after application of air current. Without covers, the sum of the periods of flame for each of the series of six tests(three in warp and three in weft) shall be less than 45 s and no individual value shall be greater than 15 s and no flame re-appearance after application of air current	Drum temperature shall not exceed 400 ^{0}C and there shall not be any sign of flame. In each case total four samples to be tested, in two cases bottom cover facing drum and in another two cases top side facing the drum. In both cases test to be carried out as per Method A and Method B
	Test Methods	Annex A/(ISO 284)	Annex B/(ISO 340)	Annex C/(ISO 20238)

ANNEX A

(*Clause* 5.1)

CONVEYOR BELTS — ELECTRICAL CONDUCTIVITY OR ANTISTATIC PROPERTIES — SPECIFICATION AND TEST METHOD

A-1 PRINCIPLE

An electric current of specified voltage is passed via electrodes through a suitably prepared test piece taken from the belt.

A-1.1 Materials and Apparatus

A-1.1.1 Sheet of insulating material, a little larger than the test piece.

A-1.1.2 Two cylindrical and coaxial brass electrodes**,** the base of one being circular and the other annular.

A-1.1.3 The dimensions and masses of electrodes shall as per Fig. 1. The bases of these electrodes shall be machined flat and polished. A flexible insulated wire shall be connected to each electrode.

A-1.1.4 Ohmmeter (resistance measuring instrument*),* with a range up to $10^{10}\ \Omega$ and accurate to 5 percent.

A-1.1.5 Source of direct current, adjustable up to 1 000 V, and not permitting a current greater than 10 mA or causing an energy dissipation of more than 1 W in the test piece.

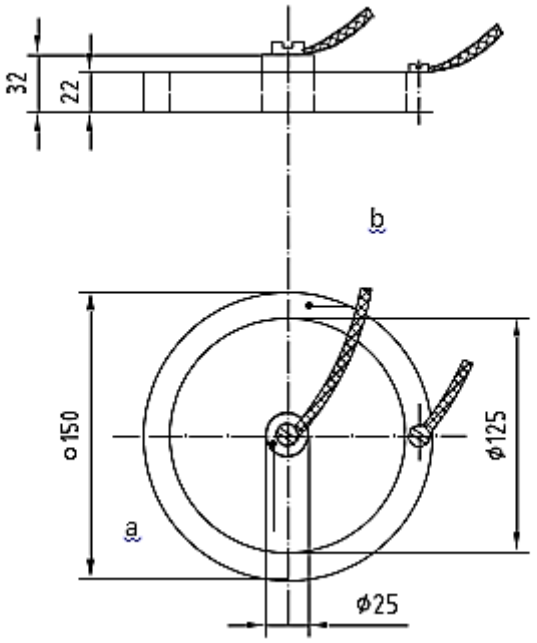
The source of current may be either an accumulator or a rectified, stabilized AC-power supply.

A-1.1.6 Contact agent (to ensure good contact between electrodes and test piece), having an electrical surface resistivity not higher than $10^{4}\ \Omega$.

Suitable composition contact agent is given in Table 1.

Table 1 — Suitable Composition of Contact Agent

Sl No.	Component	Proportion Parts by Mass
(1)	(2)	(3)
i)	Anhydrous polyethylene glycol (molecular mass: 600)	800
ii)	Water	200
iii)	Potassium chloride	10
iv)	Soft soap (pharmaceutical quality)	1



All Dimensions in millimeters

FIG. 1 ELECTRODES

Key

a = electrode of minimum mass of 115 g
b = electrode of minimum mass of 900 g

A-1.2 Test Pieces

A-1.2.1 *Dimensions* — The test piece shall be square and shall be cut from the full thickness of the belt. The length of a side shall be 300 mm minimum.

A-1.2.2 *Number* — Test pieces shall be taken as per ISO 282.

A-1.2.3 *Cleaning of Test Surfaces* — Clean both surfaces of the test piece by rubbing with fuller's earth, (this is, hydrated magnesium- aluminum silicate), for example, using a clean cloth. After cleaning away all traces of the powder, wipe the surface with a clean cloth moistened with distilled water and then dry with a clean cloth.

A-1.3 The Atmosphere for Conditioning and Testing

Before testing, expose the test piece for at least 2 h to one of the standard laboratory atmospheres specify in ISO 18573. Conduct the test in this atmosphere (*see* Annex C). An atmosphere of 27 °C, 2 °C and 65 percent 5 percent relative humidity is preferred.

A-1.4 Procedure

A-1.4.1 Check the test room atmosphere.

A-1.4.2 Paint on one of the surfaces of the test piece the contact agent described in **4.2.5** in the two areas as illustrated in Fig. 2. Great care shall be taken to ensure the accuracy of the dimensions of the areas, but the symmetry of the center is not critical. If the test piece surface is flat, this may be painted on the bottom surface of the cleaned electrodes. In the case of textured surfaces, the two areas shown in Fig. 2 shall be painted on the test piece. The test shall be carried out immediately after painting.

NOTE — In the case of covers with surface undulations, contact between the electrodes and the test piece can be improved by thin sheets of metal foil of the same dimensions as the brass electrodes, placed on the liquid contact agent and made to follow the form of the surface by rubbing lightly with the finger. The brass electrodes are then placed on the foil.

A-1.4.3 Place the test piece on the sheet of insulating material, with the test surface upwards.

A-1.4.4 Clean the lower faces of the brass electrodes and place them on the liquid contact agent pattern on the test piece.

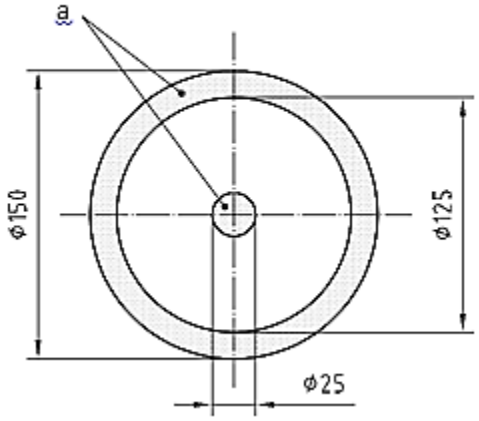
A-1.4.5 Take care not to breathe out on the test surface, as any condensation of moisture may falsify the result.

A-1.4.6 Connect the outer electrode to the earth or low voltage terminal of the measuring instrument.

A-1.4.7 Connect the inner electrode to the high voltage terminal of the measuring instrument.

A-1.4.8 Measure the resistance after applying the voltage for at least 1 min.

A-1.4.9 Repeat the test on the other surface of the test piece.



All dimensions in millimeters

FIG. 2 — DESIGN TO BE PAINTED ON THE TEST-PIECE

Key

a = contact agent

A-1.5 Expression of Results — For each surface of the belt subjected to test, record the electrical resistance, in ohms.

A-1.6 Test Report

The test report shall include the following information:

a) Complete designation of the conveyor belt material and the manufacturing date;
b) Test room temperature and relative humidity;
c) Conditioning period;
d) Contact agent applied;
e) Voltage applied to the electrodes;
f) Results of the tests;
g) Date of test; and
h) Any deviations from the standard test.

ANNEX B
(*Clause* 5.2)

CONVEYOR BELTS — LABORATORY SCALE FLAMMABILITY CHARACTERISTICS — REQUIREMENTS AND TEST METHOD

B-1 Requirements

B-1.1 Period of After Flame (After removal of flame) — The sum of the periods of flame for each of the series of six tests (*see* **B-2.1.2**) shall be less than 45 s and no individual value shall be greater than 15 s (*see* **4.5**).

B-1.2 Non-reappearance of Flame (After applying a current of air) — Flame shall not reappear (*see* **B-4.6**).

B-2 PRINCIPLE

A test piece cut from a conveyor belt is suspended vertically above a gas flame for a specified time, after which the gas flame is removed. The after-flame time is measured. Any re-flame is noted when the test piece is later subjected to a current of air.

B-2.1 Test pieces

B-2.1.1 *General*

The test pieces described in **A-1.2** shall be taken at a minimum distance of 50 mm from the edges of the belt.

B-2.1.2 Conveyor belting with a textile carcass.

B-2.1.3 For tests on conveyor belts with and without covers.

B-2.1.4 For the test pieces each (200 mm ± 5 mm) X (25 mm ± 1 mm) as follows:

a) Three test pieces, with covers intact, in the longitudinal direction of the conveyor belt;

b) Three test pieces, with covers intact, in the transverse direction of the conveyor belt;

c) Three test pieces, with covers, removed, in the longitudinal direction of the conveyor belt; and

d) Three test pieces, with covers, removed, in the transverse direction of the conveyor belt.

B-2.1.5 Covers may be removed by stripping, cutting or buffing. If covers are removed by buffing, care should be taken to ensure that the test piece is not overheated or that any threads of a textile carcass are not damaged. The covers of the textile conveyor shall be removed on both sides. This is typically achieved when the top of the fabric knuckles is consistently visible for the majority of the sample area exposing only skim material. The knuckles shall not be damaged or frayed.

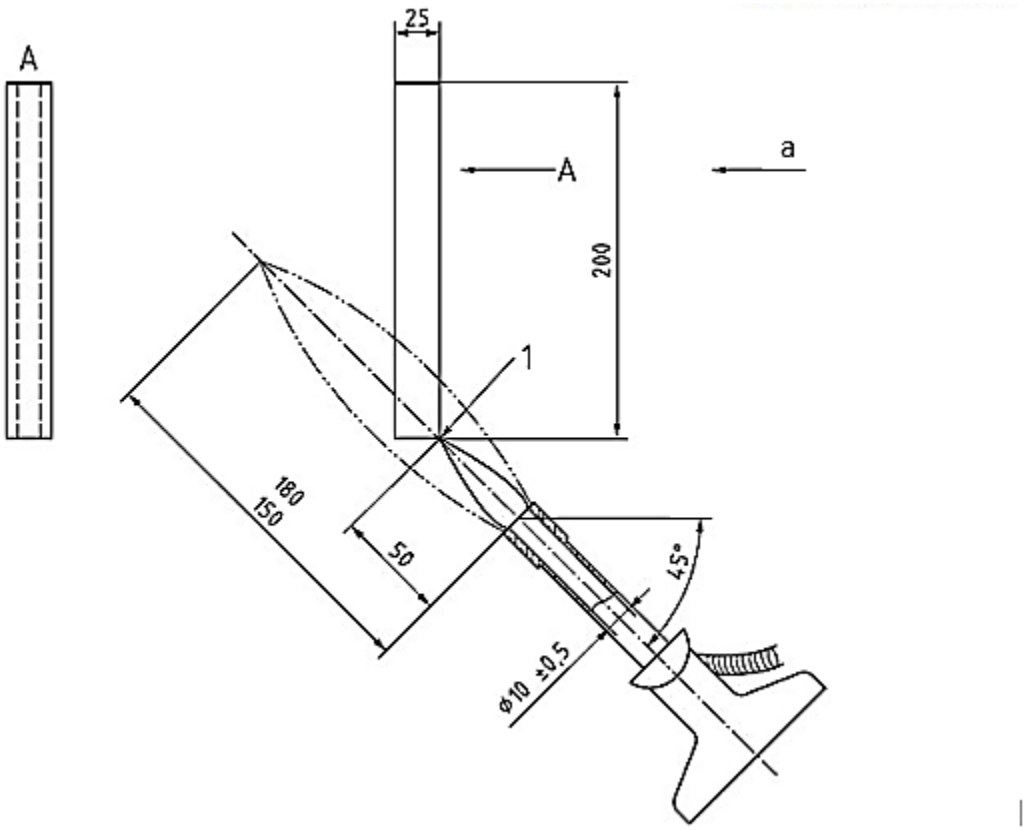
B-2.1.6 *For the Tests on Conveyor Belts with Covers Intact* FR-K — If the product specification FR -K type, then the test are to be conducted on conveyor belts with the covers intact, conduct test pieces as described in **B-2.1.4** a and b.

B-2.1.7 *For Tests on Conveyor Belts with Cover and Without Cover* FR-S — If the product specification is FR-S, then tests are to be conducted with cover and without cover as described **B-2.1.4** a, b, c and d.

B-3 APPARATUS

Following apparatus and equipment shall be used:

a) Gas Burner (Bunsen tye) has a burner tube with an inside diameter of (10 ± 0.5) mm as illustrated in Fig. 1.
b) Gas Commercial Propane or LPG gas.



All Dimensions in Millimeters

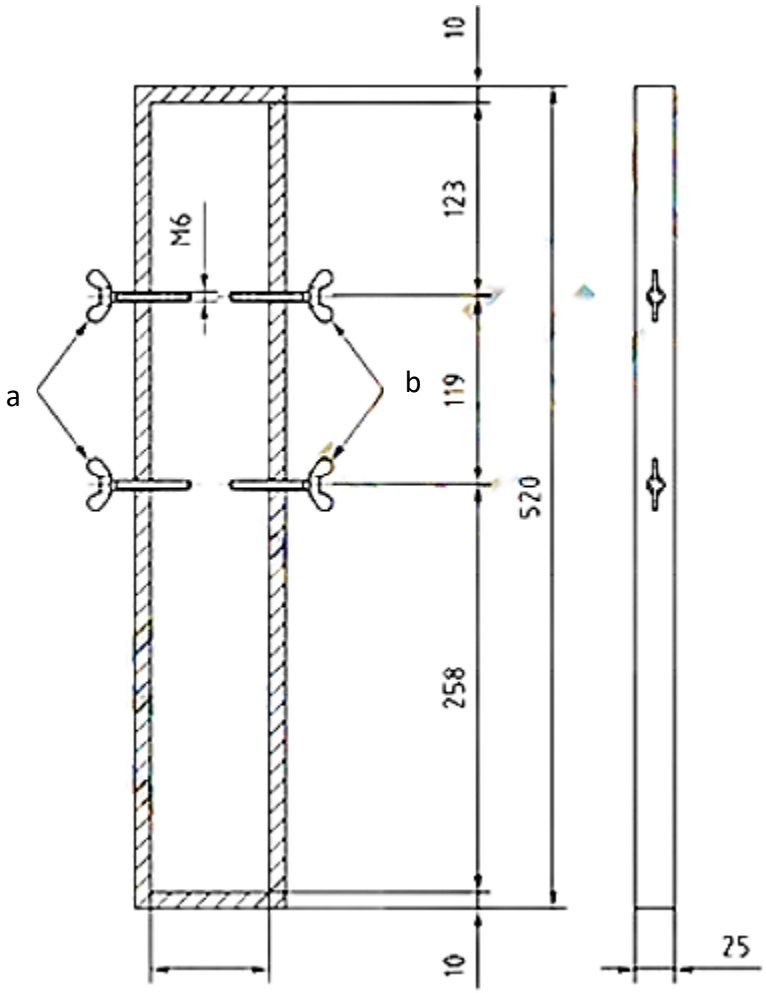
FIG. 3 ILLUSTRATION OF GAS BURNER AND TEST PIECE CONFIGURATION DURING TEST

Key:

a) = Thermocouple a Direction of air current to be applied after removal of flame

c) Timing devices, capable of being read to 0.2 s or less.
d) Measuring devices, graduated in millimeters or submultiples of millimeters and calibrated to an appropriate accuracy.
e) Test piece holder and location clips, consisting of a rectangular frame not less than 520 mm high, having two sides spaced at least 75 mm apart on which are installed suitable device for holding the test piece in a vertical plane at least 20 mm from the frame, e.g. clips or wing screws. The frame is fitted onto suitable support to maintain the sides in a vertical orientation during the test. Fig. 2 shows the test piece holder and one possible way of mounting the sample. As some products of combustion

are corrosive, the test apparatus should be constructed of a material that will not be adversely affected.



All Dimensions in Millimeters

FIG. 2 TEST PIECE HOLDER

Key :

a) = M6 wing Screw

b) = this bolt is only an example of any suitable holding device that can be used.

f) Calibrated NiCr/NiAl thermocouple or its equivalent

g) Means of applying a current of air, having a normal oxygen content and relative humidity no greater than 80 percent at a temperature not exceeding 30° C at a velocity of 1.5 m/s + 0.1 m/s at the lower tip of the sample.

h) **Location of Test** — A location in which the air movement is less than 0.2 m/s at the commencement of the test and is not further influenced by mechanical devices operating during the test is required. The volume of air surrounding the test location shall be such that the test is not affected by any

reduction of oxygen concentration. If an open-fronted cabinet is used for the test, the provision shall be made to permit the test piece to be mounted at least 300 mm from any wall.

j) **Conditioning of Test Pieces** — Samples shall be stored in dry and flat condition for at least 24 h before the test.

B-4 PROCEDURE

B-4.1 Test carried out in an ambient atmosphere.

B-4.2 Test piece as described in **2.5** and Fig. 2, ensuring that the test piece is in a vertical position.

B-4.3 The burner lighted and, adjusted for the gas flow to give a total flame height of 150 mm to 180 mm, with an inner flame length of approximately 50 mm. The thermocouple shall be positioned at the hottest part of the flame just above the inner flame cone as shown in Fig. 1.

If required, the burner achieve flame temperature of (1000 ± 200) ^{o}C.

B-4.4 Position the burner at 45^{0} (*see* Fig. 3), immediately under the central vertical axis in the planner center line of the test piece with the top of the burner tube 50 mm below the bottom edge of the test piece.

B-4.5 After 45 s remove the burner from the test piece without extinguishing it. Keep the burner sheltered from any current of air if further tests are to be performed. Once the burner is removed record the after-flame time of the sample (if any) and/or after-glow (if any).

B-4.6 Immediately after the flame disappears turn on the air current at a predetermined velocity for 1 minute measuring the after-glow (if any) and checking if the sample reignites. If the sample reignites, the duration of flame shall be measured and added to the duration of flame measured in the step before. This period of flaming shall not be included in the after-glow period.

B-5. Expression of Result

B-5.1 For each of the test pieces tested (*see* **B-2.1**), report which, if any, of the test pieces underwent the flame **4.5** and the duration of such flame.

B-5.2 For each of the test pieces tested, report which, if any, of the test pieces underwent re-flame in **B-4.6** and the duration of any such re-flame.

B-5.3 Report the maximum value of the individual results obtained in **B-5.1** and **B-5.2.**

B-5.4 If there is no evidence of any flame in **4.5**, report “no flame”.

B-5.5 If there is no evidence of any re-flame in **4.6**, report “no re-flame”.

B-5.6 Document the total duration of after flame for each sample, including such time that the sample may have flamed after a possible re-ignition. Report the duration of after-glow for each test sample as well.

B-5.7 Furthermore document the sum of after-flame and after-glow for each set of 6 samples (*see* **2.1**).

B-6 TEST REPORT

The test report shall include the following information as a minimum

a) A statement that the test was carried out in accordance with Annex B;

b) Any deviation in the test method;

c) Date of test;

d) The ambient condition of temperature, humidity, and barometric pressure in the area where the test was carried out;

e) Identification of the conveyor belt tested;

f) Whether test pieces were selected in accordance with 2.1; and

g) Results of the test as required in 5.0.

ANNEX C

(*Clause* 5.6)

CONVEYOR BELTS – DRUM FRICTION TESTING

The purpose of this test is to provide a method of testing that will assist conveyor belt users in assessing the degree of risk which can be anticipated from the hazard caused when a conveyor belt stalls and the drive mechanism of the conveyor system continues to operate, causing localized heating of the conveyor belt through contact with the driving drum or other frictional heat sources.

A test piece of conveyor belt, suitably mounted and tensioned, is wrapped halfway around a rotating steel drum, simulating a stalled belt. The test is continued at specified tensions for a given time, or until the belt parts or breaks. The presence, or absence, of flame or glow, is noted and reported and the maximum temperature of the drum is recorded. The test is conducted in still air and/or in moving air. In this test, arc of contact is 180^0 and the test is carried out in fixed load.

C-1 APPARATUS

C-1.1 Steel drum, of external diameter 210 ± 1 mm mounted on a horizontal axis and capable of being rotated under all load conditions at 200 ± 5 rpm throughout the test. The outer shell of the drum shall be manufactured from a tube complying with ISO 9329-1 or ISO 9330-1. The surface roughness, R_a, of the drum surface shall be a maximum of 1.6 μm.

NOTE — Experience has shown that motors of between 7.5 kW and 15 kW have proven suitable for maintaining these conditions, although, for smaller motors, a "soft start" can be necessary.

The basic dimensions of the drum, shown in Fig. 2, are given to standardise its thermal characteristics. The variation in diameter along the length of the drum shall not exceed 1 mm.

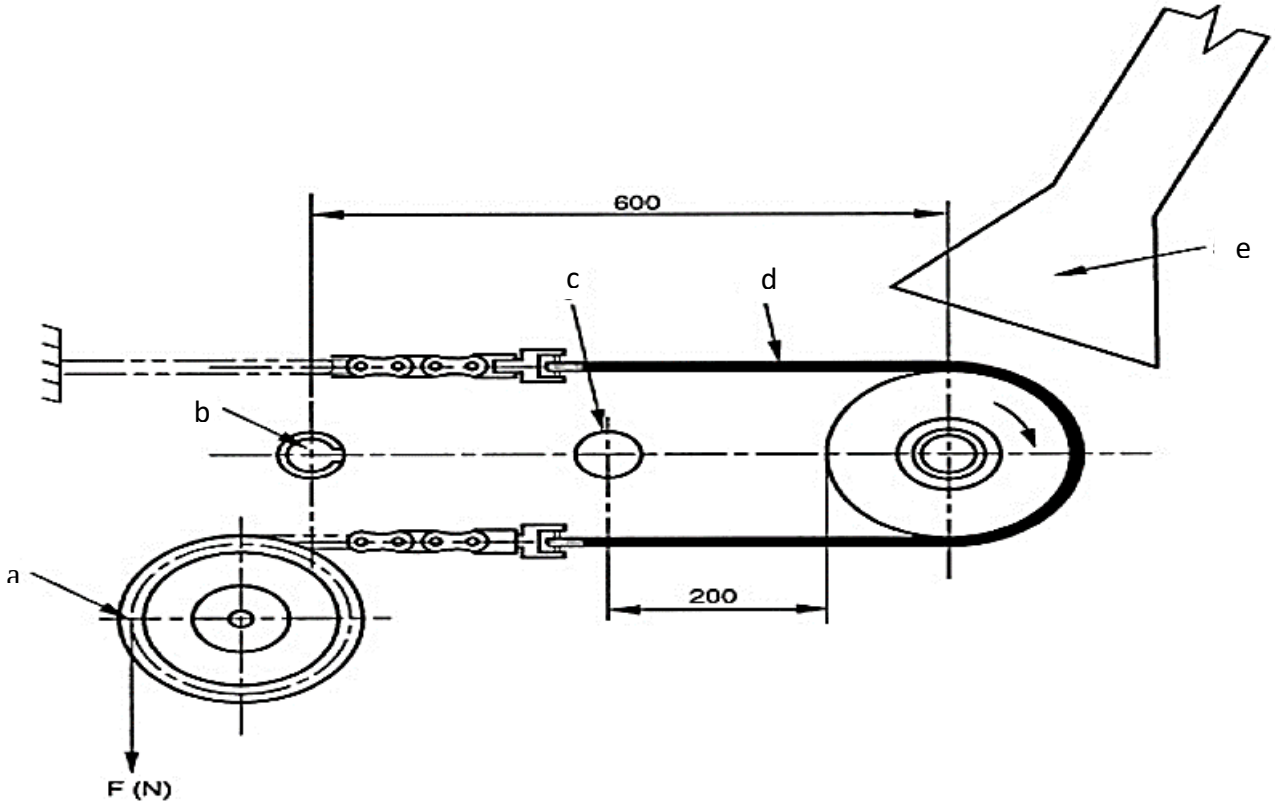
Notwithstanding the dimensions and tolerances on the drum diameter and shell thickness shown in Fig. 2 the effect of wear down to a minimum shell thickness of 6 mm is permissible, but the overall diameter of the drum shall not become less than 209 mm.

C-1.2 Mineral-insulated stainless steel sheathed thermocouple, having a maximum outside diameter of 2 mm. It shall be used to determine the drum temperature. The tip of the thermocouple shall be set not more than 0.5 mm below the surface of the drum, midway along its length.

More than one thermocouple may be fitted to provide backup in the event of failure.

Take care to see that the effective "cold junction" temperature is compensated for, or, is measured and the appropriate correction is made.

The functioning of the rotating contacts shall be checked periodically by observing that there is no change in the recorded temperature when the apparatus is run without a test piece.

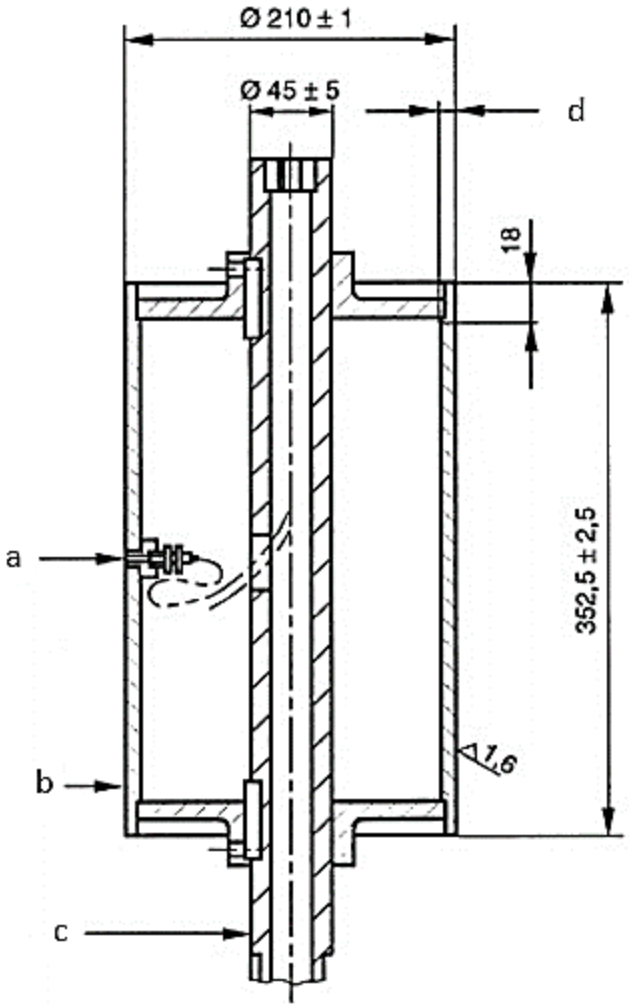


All Dimensions in Millimeters

FIG. 4 SCHEMATIC ARRANGEMENT FOR DRUM FRICTION APPARATUS

key:

a) Guide Pulley
b) Perforated Air Supply Pipe
c) Anemometer
d) Test Piece
e) Fume Extraction Hood



All Dimensions in Millimeters

FIG. 5 CROSS-SECTION OF THE STEEL DRUM AND THERMOCOUPLE HOUSING FOR DRUM FRICTION TEST

Key:

a) Temperature probe

b) Outer shell manufactured from stainless steel tube

c) Shaft material grade 2 C 22

d) Shell thickness 6.375 ± 0.375mm

C-1.3 A tensioning system, capable of applying the fixed 343 N tension as spin **C-3.2.1** and **C-3.2.2.**

C-1.4 Air current, having a velocity of (2.0 ± 0.1) m/s at a distance of 200 mm from the surface of the horizontal steel drum when the sample of the conveyor belt is in position ready for the test. It shall be supplied from a pipe complying with DN 10 of ISO 65. The pipe shall have 36 holes, each nominally of 1.5 mm diameter at 10 mm pitch.

The distance between the center line of the perforated pipe and the steel drum shall be 600 mm as shown in Fig. 4.

The air supplied to the apparatus shall be at normal ambient temperature, but tests shall not be carried out in air, at a temperature of less than 5° C.

C-1.4.1 Anemometer, positioned 200 mm from the surface of the drum on the same horizontal plane as the perforated pipe and capable of measuring the velocity of the air current to an accuracy of ± 5 percent.

C-2 TEST PIECE

Cut each test piece from a position not less than 50 mm from the edges of the conveyor belt and not less than 100 mm from the end of the conveyor belt. Each test piece shall be 150 mm wide and more than 750 mm long, from positions parallel to the longitudinal direction of the conveyor belt.

NOTE — The precise length of the test piece depends on the details of the tensioning system (**C-1.3**). *see* Fig. 4.

C-3 PROCEDURE

C-3.1 General

Thoroughly clean the surface of the steel drum to remove all traces of rust or residual debris, using abrasive paper or cloth. Ensure that the temperature of the drum does not exceed 30° C at the start of any test.

WARNING — Before starting the test, it should be verified that all the necessary precautions have been taken to ensure the safety of the operatives conducting the test and that they are not exposed to fumes.

C-3.2 Procedure and Test

C-3.2.1 *Selection of Test Method*

One of the test methods with 180° arc of contact shall be the preferred option. Where it is not possible to attain 180° arc of contact between the conveyor belt and the drum due to the thickness and/or stiffness of the conveyor belt, a method using the reduced arc of contact shall be used.

The tolerance on the contact angle shall be ± 5°. Select four test pieces referring to **C-2**.

C-3.2.2 *Method A — Tests in still air*

C-3.2.2.1 *General*

Conduct one of the procedures in **3.2.1.2** as specified in the product or safety specification. Conduct two tests with the carrying side of the belt in contact with the steel drum (**C-1.1)** and two tests with the reverse side of the belt in contact with the steel drum.

C-3.2.2.2 *Method A — Test in still air with fixed end load*

Pass the test piece through an arc of 180° around the steel drum ensuring the conveyor belt is in contact with the drum throughout the 180° are ensure that one end is rigidly secured and the other end attached to the tensioning system as shown in Fig. 1. Apply a force of 343 N.

Rotate the drum at 200 ± 5 rpm in a direction away from the rigidly secured end of the test piece (that is, similar to the forward direction of a conveyor drive). Maintain the force of 343 N for 60 min or until the test piece parts or breaks. If after 60 min the test piece is unbroken, remove the test piece from the drum and examine the test piece for any flame during or after the test. Record the maximum surface temperature of the drum during the test.

C-3.3.2 *Method B — Tests in Moving Air*

C-3.3.2.1 *General*

Conduct one of the procedures in **C-3.2.2** as specified in the product or safety specification. Conduct two tests with the carrying side of the conveyor belt in contact with the steel drum (**C-1.1**) and two tests with the reverse side of the conveyor belt in contact with the steel drum.

C-3.3.2.2 *Method B — Tests in moving air with fixed end load*

Conduct the test as described in **C-3.3.2** in an air current having a velocity of 2.0 ± 0.1 m/s at a temperature greater than 5° C (*see* **C-1.4**).

Pass the test piece through an arc of 180° around the steel drum ensuring the conveyor belt is in contact with the drum throughout the 180°. Ensure that one end is rigidly secured and the other end attached to the tensioning system as shown in Fig. 1. Apply a force of 343 N.

Rotate the drum at 200 ± 5 rpm in a direction away from the rigidly secured end of the test piece (that is, similar to the forward direction of a conveyor drive). Maintain the force of 343 N for 60 min or until the test piece parts or breaks. If after 60 min the test piece is unbroken, remove the test piece from the drum and examine the test piece for any flame during or after the test. Record the maximum surface temperature of the drum during the test.

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Conveyor Belts Sectional Committee, PGD 40

Organization	*Representative(s)*
National Thermal Power Corporation Limited, New Delhi	SHRI APURBA GHOSH (***Chairperson***)
Directorate General of Mines Safety, Dhanbad	SHRI M ARUMUGAM
Central Mine Planning and Design Institute Limited, Ranchi	MR. SHRI PARAG MAJUMDAR MR. SHRI P.K. PAUL (*Alternate*) MR. AJOY KUMAR SINGH (*Convenor*)
Directorate General of Mines Safety, Dhanbad	SHRI D B NAIK MR. SHRI KAUSHIK SENGUPTA (*Alternate*)
Fenner Conveyor Belting Private Limited, Madurai	SHRI M VIVEK SHRI SANTOSH N KOSARKAR (*Alternate* I) MR. SHRI N.SRIDHAR (*Alternate* II)
Forech India Limited, Sonipat	SHRI I.K. BAHL SHRI TIMIR BHATTACHARYYA (*Alternate*)
Indian Rubber Manufacturers Research Association, Mumbai	MR. K. RAJ KUMAR MS. SUCHISMITA SAHOO (*Alternate*)
International Conveyors Limited, Aurangabad	SHRI U. D. DOUND MR. SHRI PINAKI SEN (*Alternate* I) MR. SHRI SUDEEP SAHA (*Alternate* II)
J K Fenner India Limited, Madurai	MR. SHRI S. MAJUMDAR MR. SHRI D SRINIVASAN (*Alternate*)
Multiple Fabric Company Limited, Kolkata	SHRI SHABBIR TOPIWALA SHRI HAMZA TOPIWALA (*Alternate*)
NTPC Hyderabad, Secunderabad	MR. SHRI VIVEK KUMAR UPADHYAY
NTPC Limited, New Delhi	MR. SHRI ABHIJIT NAG MR. SHRI VIVEK KUMAR UPADHYAY (*Alternate*)
Oriental Rubber Industries Private Limited, Pune	MR. SHRI CHINMAY RAY SHRI VIKRAM MAKAR (*Alternate*)
Phoenix Conveyor Belt India Private Limited, Kolkata	MR. SHRI. MAYUKH SAHA MR. SHRI SUBRATA CHAKRABORTY (*Alternate* I) MR. DR. SUGATA CHAKRABORTY (*Alternate* II)
Scandia Belting Company Private Limited, Kolkata	SHRI G. B. GANGULY SHRI PARTHA SARTHI BISWAS (*Alternate* I) MR. SHRI ARSHED HUSSAIN (*Alternate* II)
In Personal Capacity (*D*-1, *Kailashpuri Complex, Kusum Vihar. Phase-2, Koylanagar, Dhanbad, Jharkhand*)	MR. SHRI K. K. S. SINHA

In Personal Capacity (*A1-201, Doshi Firstnest Apartment, Thirumudivakkam Main Road Thirumudivakkam Chennai 600132*)	SH. K.EUGENE PACCELLI
BIS Directorate General	SHRI R.R. SINGH, SCIENTIST 'F' AND HEAD (PGD) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI VICHITRA VIR SINGH
SCIENTIST 'D'/JOINT DIRECTOR (PGD), BIS