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**Conveyor belts — Laboratory scale  
flammability characteristics —  
Requirements and test method**

*Courroies transporteuses — Caractéristiques d'inflammabilité d'échelle  
de laboratoire — Exigences et méthode d'essai*

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Published in Switzerland

## Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 340 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 3, *Conveyor belts*.

This third edition cancels and replaces the second edition (ISO 340:1988), which has been technically revised by standardization using a single fuel source and a standardized burner having carefully controlled dimensions within a universally available design. Greater attention has been paid to the measures to be taken in conducting the test to ensure the safety of the personnel involved.

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## Introduction

At the 16th meeting of ISO/TC41/SC3 held in Nara, Japan, it was agreed that in addition to changes which were necessary to allow the selection of test pieces from steel cord conveyor belts, this International Standard should be revised in order to improve the reproducibility of the test method.

This revision has attempted this by:

- a) standardizing the specification of the burner;
- b) standardizing the orientation of the test piece with respect to the heat source;
- c) measuring the heat energy impinging on the test piece.

In preparing this International Standard, reference has also been made to ISO/TR 10353:1992.

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# Conveyor belts — Laboratory scale flammability characteristics — Requirements and test method

**CAUTION** — This method of test is not designed to assess the fire hazard of any given product. The results may help in the assessment of ignition hazard but should not be used in isolation as evidence that a product or material is safe.

## 1 Scope

This International Standard specifies a method for assessing, on a small scale, the reaction of a conveyor belt to an ignition flame source. It is applicable to conveyor belts having a textile carcass as well as steel cord conveyor belts.

## 2 Normative references

The following referenced documents are indispensable for the application 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 8056-1, *Aircraft — Nickel-chromium and nickel-aluminium thermocouple extension cables — Part 1: Conductors — General requirements and tests*

ISO 9162:1989, *Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications*

ISO 18573:2003, *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

#### **afterflame**

flame which persists after the ignition source has been removed

[ISO 13943:2000, Definition 1]

### 3.2

#### **afterglow**

persistence of glowing, after cessation of flaming or, if no flaming occurs, after the ignition source has been removed

NOTE Adapted from ISO 13943:2000.

### 3.3

#### **flame, noun**

zone of combustion in the gaseous phase, usually with emission of light

[ISO 13943:2000, Definition 60]

### 3.4

#### **flame, verb**

to undergo combustion in the gaseous phase with emission of light

[ISO 13943:2000, Definition 61]

### 3.5

#### **glowing**

made luminous by heat (without flame)

NOTE Adapted from ISO 13943:2000.

## 4 Requirements

### 4.1 Periods of combustion (after removal of the burner)

The sum of the periods of combustion for each of the series of six tests (see 5.3) shall be less than 45 s and no individual value shall be greater than 15 s (see 5.7.5).

### 4.2 Non-reappearance of flame (after applying a current of air)

The flame shall not re-appear (see 5.7.6).

## 5 Test method

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### 5.1 Health and safety

#### 5.1.1 Smoke and fumes

The ignition and burning of polymeric materials may cause smoke and toxic gases to be released and which can affect the health of operators. It is therefore of great importance that suitable means be provided to clear the test area of smoke and fumes.

#### 5.1.2 Handling, storage and disposal of liquefied petroleum gas containers

All the relevant local safety regulations shall be taken into account for the handling and storage of liquefied petroleum gas (LPG) and for the disposal of used LPG containers.

If local safety regulations require the LPG cylinders to be stored in an environment that is cooler than the test area or some distance from the test rig, a sufficient length of tubing is needed inside the controlled environment to ensure that the gas equilibrates to the required temperature before flow measurement. One way to facilitate this is to pass the gas (before flow measurement) through a metal tube immersed in water maintained at 25 °C.

### 5.2 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 afterflame time and afterglow times are measured. Any recombustion is noted when the test piece is later subjected to a current of air.

### 5.3 Test pieces

#### 5.3.1 General

The test pieces described in 5.3.2 and 5.3.3 shall be taken at a minimum distance of 50 mm from the edges of the belt.

#### 5.3.2 Conveyor belting with a textile carcass

##### 5.3.2.1 For tests on conveyor belts with and without covers

**5.3.2.1.1** Prepare twelve test pieces, each  $(200 \text{ mm} \pm 5 \text{ mm}) \times (25 \text{ mm} \pm 1 \text{ mm})$  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 (see 5.3.2.1.2), in the longitudinal direction of the conveyor belt;
- d) three test pieces, with covers removed (see 5.3.2.1.2), in the transverse direction of the conveyor belt.

**5.3.2.1.2** Covers may be removed [see 5.3.2.1.1 c) and d)] by stripping, cutting or buffing. If covers are removed by buffing, care should be exercised to ensure that the test piece not be overheated or that any threads of a textile carcass not be damaged.

##### 5.3.2.2 For tests on conveyor belts with covers intact

If the product specification requires the test to be conducted on conveyor belts with the covers intact, conduct only six tests on test pieces as described in 5.3.2.1.1 a) and b).

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##### 5.3.2.3 For tests on conveyor belts designed for use without covers

If the product specification requires the test to be conducted on conveyor belts which are by design intended to be used without covers, conduct only six tests on test pieces as described in 5.3.2.1.1 c) and d).

#### 5.3.3 Steel cord conveyor belts

##### 5.3.3.1 For tests on conveyor belts with covers intact

If the product specification requires the test to be conducted on conveyor belts with the covers intact, cut six test pieces in the longitudinal direction of the belt, each  $200 \text{ mm} \pm 5 \text{ mm}$  long, as close as possible to 25 mm wide depending on the cord diameter and pitch. Each test piece shall be at least 20 mm wide and contain at least two cords, with the cut edges representing the centreline between adjacent cords.

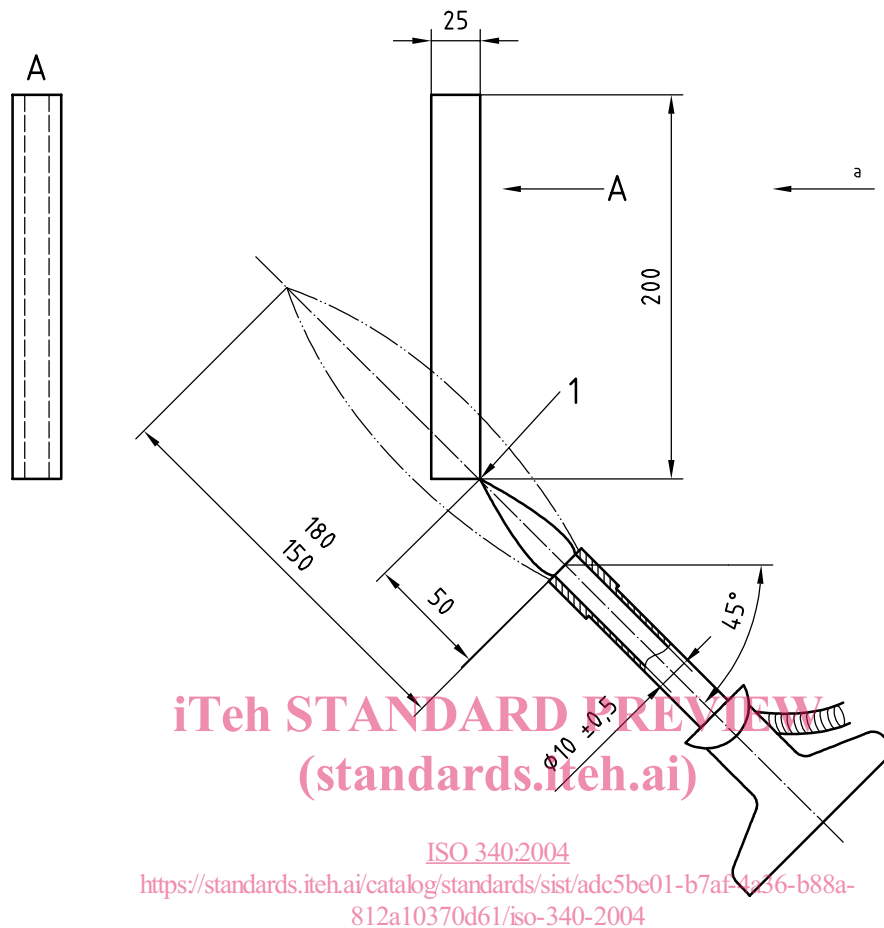
##### 5.3.3.2 For tests on conveyor belts with covers removed

If the product specification requires the test to be conducted on conveyor belts without covers, cut six test pieces as described in 5.3.3.1 and remove the covers, e.g. by stripping, cutting or buffing.

### 5.4 Apparatus

**5.4.1 Gas burner (Bunsen type)**, having a burner tube of inside diameter of  $(10 \pm 0,5) \text{ mm}$ , as illustrated in Figure 1.

**5.4.2 Commercial propane gas**, as specified in ISO 9162:1989.

**Key**

1 thermocouple (see 5.4.6)

<sup>a</sup> Direction of air current to be applied after removal of burner.**Figure 1 — Illustration of gas burner and test piece configuration during test****5.4.3 Timing devices**, capable of being read to 0,2 s or less.**5.4.4 Measuring devices**, graduated in millimetres or submultiples of millimetres and calibrated to an appropriate accuracy.**5.4.5 Test piece holder and location clips**, consisting of a rectangular frame not less than 500 mm high, having two sides spaced 75 mm apart on which are fitted suitable clips for mounting the test piece in a vertical plane at least 20 mm from the frame. The frame is fitted onto a suitable support to maintain the sides in a vertical orientation during the test.

As some products of combustion are corrosive, the test apparatus should be constructed of material that will not be adversely affected.

**5.4.6 Calibrated NiCr/NiAl thermocouple**, as specified in ISO 8056-1 or its equivalent.**5.4.7 Means of applying a current of air**, having a normal oxygen content and a relative humidity no greater than 80 % at a temperature not exceeding 30 °C at a velocity of 1,5 m/s.



## 5.5 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, provision shall be made to permit the test piece to be mounted at least 300 mm from any wall.

## 5.6 Conditioning of test pieces

After preparation of the test pieces as described in 5.3, ensure that they are in equilibrium with one of the standard atmospheres for conditioning and testing specified in ISO 18573.

## 5.7 Procedure

**5.7.1** Carry out the test in an atmosphere having a temperature between 10 °C and 30 °C and a relative humidity between 15 % and 80 %, preferably at the same temperature and relative humidity used for conditioning or in the atmosphere applicable at the site of use, if known.

**5.7.2** Place the test piece in the clips of the test rig (5.4.5), ensuring that the test piece is in the vertical position.

**5.7.3** Light the burner and preheat it for 2 min. Adjust the gas flow to give a total flame height of between 150 mm to 180 mm, with an inner flame length of approximately 50 mm.

Position the thermocouple (5.4.6) in the hottest part of the flame (i.e. just above the inner flame cone as shown in Figure 1) and check that the temperature is  $1\,000\text{ °C} \pm 20\text{ °C}$ .

If necessary, adjust the burner flame so that the temperature recorded is  $1\,000\text{ °C} \pm 20\text{ °C}$ .

**5.7.4** Position the burner at 45° (see Figure 1), immediately under the central vertical axis in the planar centreline of the test piece with the top of the burner tube 50 mm below the bottom edge of the test piece.

**5.7.5** After 45 s, remove the burner from the test rig without extinguishing it. Keep the burner sheltered from any current of air if further tests are to be performed. Note immediately any combustion of the test piece and the duration of any such combustion and record the afterflame time and the afterglow time.

**5.7.6** Within  $60\text{ s} \pm 5\text{ s}$  after removal of the burner, apply a current of air (see 5.4.7) at right angles to the face of the test piece for 1 min. Note and record any reappearance of flame of the test piece and the duration of any such flaming.

## 5.8 Expression of results

**5.8.1** For each of the test pieces tested (see 5.3), report which, if any, of the test pieces underwent combustion in 5.7.5 and the duration of such combustion and the sum of the periods of combustion for each of the series of six tests (see 5.3).

**5.8.2** For each of the test pieces tested, report which, if any, underwent recombustion in 5.7.6 and the duration of any such recombustion.

**5.8.3** Report the maximum value of the individual results obtained in 5.8.1 and 5.8.2.

**5.8.4** If there is no evidence of any combustion in 5.7.5, report "No combustion".

**5.8.5** If there is no evidence of any recombustion in 5.7.6, report "No recombustion".

**5.8.6** Report whether the test pieces were selected in accordance with 5.3.2.1, 5.3.2.2, 5.3.2.3, 5.3.3.1 or 5.3.3.2.