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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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# Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 3, *Conveyor belts,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 188, *Conveyor belts,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition cancels and replaces the fourth edition (ISO 340:2013), which has been technically revised.

The main changes are as follows:

— normative references updated;

— terminological entry added;

— regional requirements added in Clause 4;

— Clause 5 revised by addition of illustrations, clarifications and tolerances.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

# 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 document 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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications*

EN 12882, *Conveyor belts for general purpose use - Electrical and flammability safety requirements*

EN 14973, *Conveyor belts for use in underground installations - Electrical and flammability safety requirements*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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/

**3.1**
**afterflame**
*flame* (3.3) that persists after the ignition source has been removed

[SOURCE: ISO 13943:2017, 3.11]

**3.2**
**afterflame time**
length of time for which an *afterflame* (3.1) persists under specified conditions

[SOURCE: ISO 13943:2017, 3.12, modified — Note 1 to entry has been deleted.]

**3.3**
**flame**, noun
zone of combustion in the gaseous phase, usually with emission of light

**3.4**
**flame**, verb
to flare up in the gaseous phase with emission of light

**3.5**
**afterglow**
persistence of glowing combustion after both removal of the ignition source and the cessation of any flaming combustion

[SOURCE: ISO 13943:2017, 3.13]

**3.6**
**afterglow time**
length of time for which an *afterglow* (3.5) persists under specified conditions

[SOURCE: ISO 13943:2017, 3.14]

# 4 Requirements

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

The sum of the periods of flame 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 reappear (see 5.7.6).

## 4.3 Regional requirements

In countries of the European Single Market, the requirements specified in 4.1 and 4.2 are replaced by the requirements for the applicable class specified in EN 12882 for conveyor belts for general purpose use and EN 14973 for conveyor belts for use in underground installations.

# 5 Test method

## 5.1 Health and safety

### 5.1.1 Smoke and fumes

The ignition and burning of polymeric materials can cause smoke and toxic gases to be released, 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

It is important to be aware of all the relevant local safety regulations 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 is measured. Any re-flame 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 12 test pieces, each (200 mm ± 5 mm) × (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 (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 is not overheated or that any threads of a textile carcass are not damaged.

The covers of textile conveyor belts 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.

#### 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).

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

If the product specification requires the tests to be carried out with conveyor belts that have been developed for use without covers, only six test specimens (three test specimens from the longitudinal direction and three test specimens from the transverse direction) measuring (200 ± 5) mm × (25 ± 1) mm shall be taken from the conveyor belt and being tested. As these conveyor belts are designed without covers no material will be removed from the conveyor belts according to 5.3.2.1.2.

### 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 mm ± 5 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.

The covers of steel cord conveyor belt samples shall be removed on both sides so that the surface of the steel cords of the conveyor belt sample is visible.

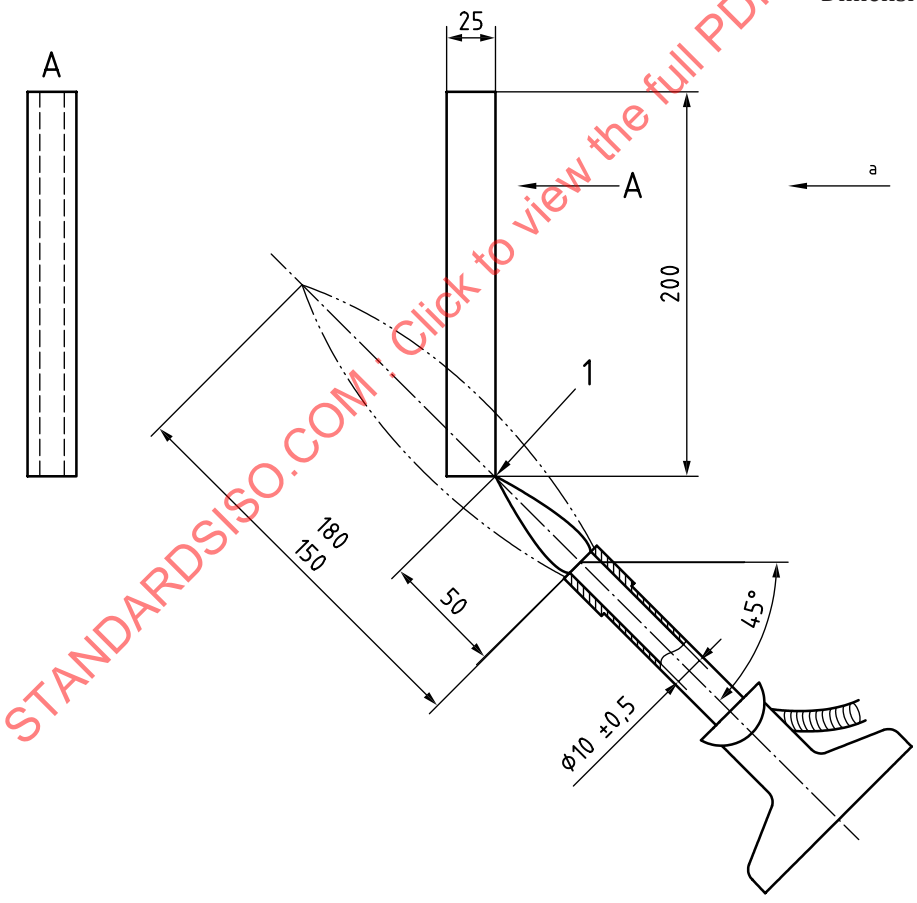
### 5.4 Apparatus

The following apparatus and equipment shall be used.

**5.4.1 Gas burner (Bunsen type),** having a burner tube with an inside diameter of (10 ± 0,5) mm, as illustrated in Figure 1.

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

Dimensions in millimetres




**Key**

1 thermocouple (see 5.4.6)

a Direction of air current to be applied after removal of burner.

**Figure 1 — Illustration of gas burner and test piece configuration during test**

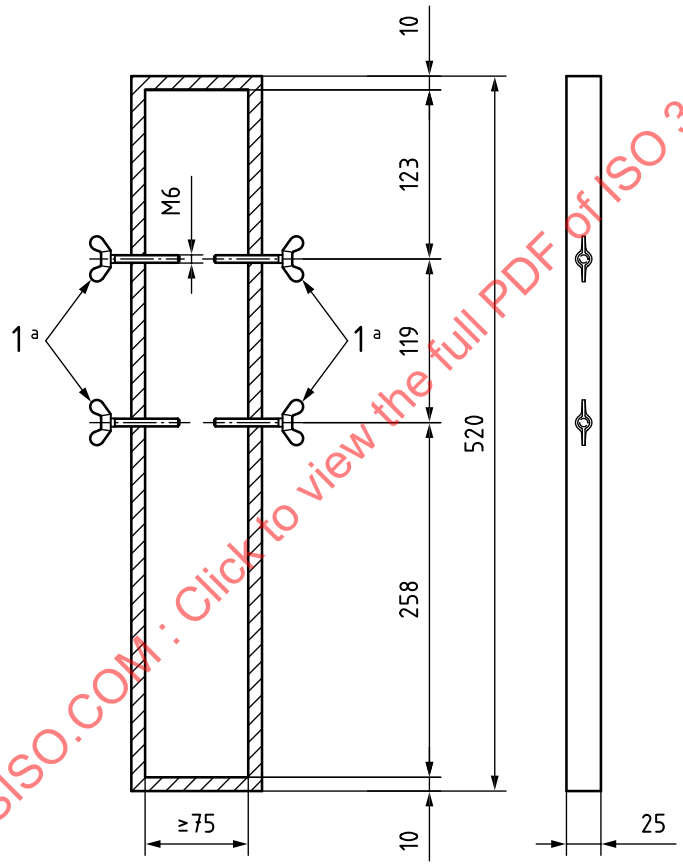
**5.4.3 Timing devices,** capable of being read to 0,2 s or less.

**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 520 mm high, having two sides spaced at least 75 mm apart on which are installed suitable devices 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 a suitable support to maintain the sides in a vertical orientation during the test. Figure 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 material that will not be adversely affected.

Dimensions in millimetres




**Key**

1 M6 wing screw

a This bolt is only an example. Any suitable holding device can be used.

**Figure 2 — Test piece holder**

**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 ± 0,1 m/s at the lower tip of the sample.

## 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

Samples shall be stored flat and dry for at least 24 h before testing.

## 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 %.

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

**5.7.3** Light the burner, 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 °C ± 20 °C.

If necessary, adjust the burner flame so that the temperature recorded is 1 000 °C ± 20 °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. Once the burner is removed, record the afterflame time of the sample (if any) and / or afterglow time (if any) (see 4.1).

**5.7.6** Immediately after the flame disappears, turn on the air current at the predetermined velocity for 1 min measuring the duration of afterglow (if any) and checking if the sample re-ignites. If the sample re-ignites, the duration of flame shall be measured and added to the duration of the flame measured in step before. This period of flaming shall not be included in the afterglow period (see 4.2).

## 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 flame in 5.7.5 and the duration of such flame.

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

**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 flame in 5.7.5, report “No flame”.

**5.8.5** If there is no evidence of any re-flame in 5.7.6, report “No re-flame”.

**5.8.6** Document the total duration of afterflame for each sample, including such time that the sample may have flamed after a possible re-ignition. Report the duration of afterglow for each sample as well.

**5.8.7** Furthermore, document the sum of afterflame and afterglow for each set of 6 samples (see 5.3).

## 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 this document (ISO 340:2022)

b) any deviations from the test method;

c) the date of test;

d) the ambient conditions of temperature, relative humidity and barometric pressure in the area in which the test was carried out;

e) the identification of the conveyor belt tested;

f) 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;

g) the results of the test as required in 5.8.