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Conveyor belts — Drum friction testing

Courroies transporteuses — Essais de frottement au tambour

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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).

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For an explanation on 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 the following URL: 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*.

Introduction

The purpose of this document 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 source.

Conveyor belts — Drum friction testing

1 Scope

This document specifies a method of testing to determine the propensity of a conveyor belt to generate heat flame or glow when held stationary, under a given tension, in surface contact around a rotating driven steel drum.

It describes means of varying the conveyor belt tension.

NOTE For conveyor belts containing steel reinforcement, it may not be possible to conduct this test in full due to the inability of the conveyor belt to comply with the requirements of 7.2. In this case, premature termination according to 7.3 can be necessary.

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 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*

ISO 7590, *Steel cord conveyor belts — Methods for the determination of total thickness and cover thickness*

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*

EN 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

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 period, 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. Two options on arc of contact are given. The reduced arc of contact test (135° of contact) with increased initial load is considered equivalent to the 180° arc of contact test.

5 Apparatus

5.1 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) r/min throughout the test. The outer shell of the drum shall be manufactured from tube complying with ISO 9329-1 or ISO 9330-1. The surface roughness, *Ra*, 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.

Basic dimensions of the drum, shown in Figure 3, are given in order to standardize 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 Figure 3, 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.

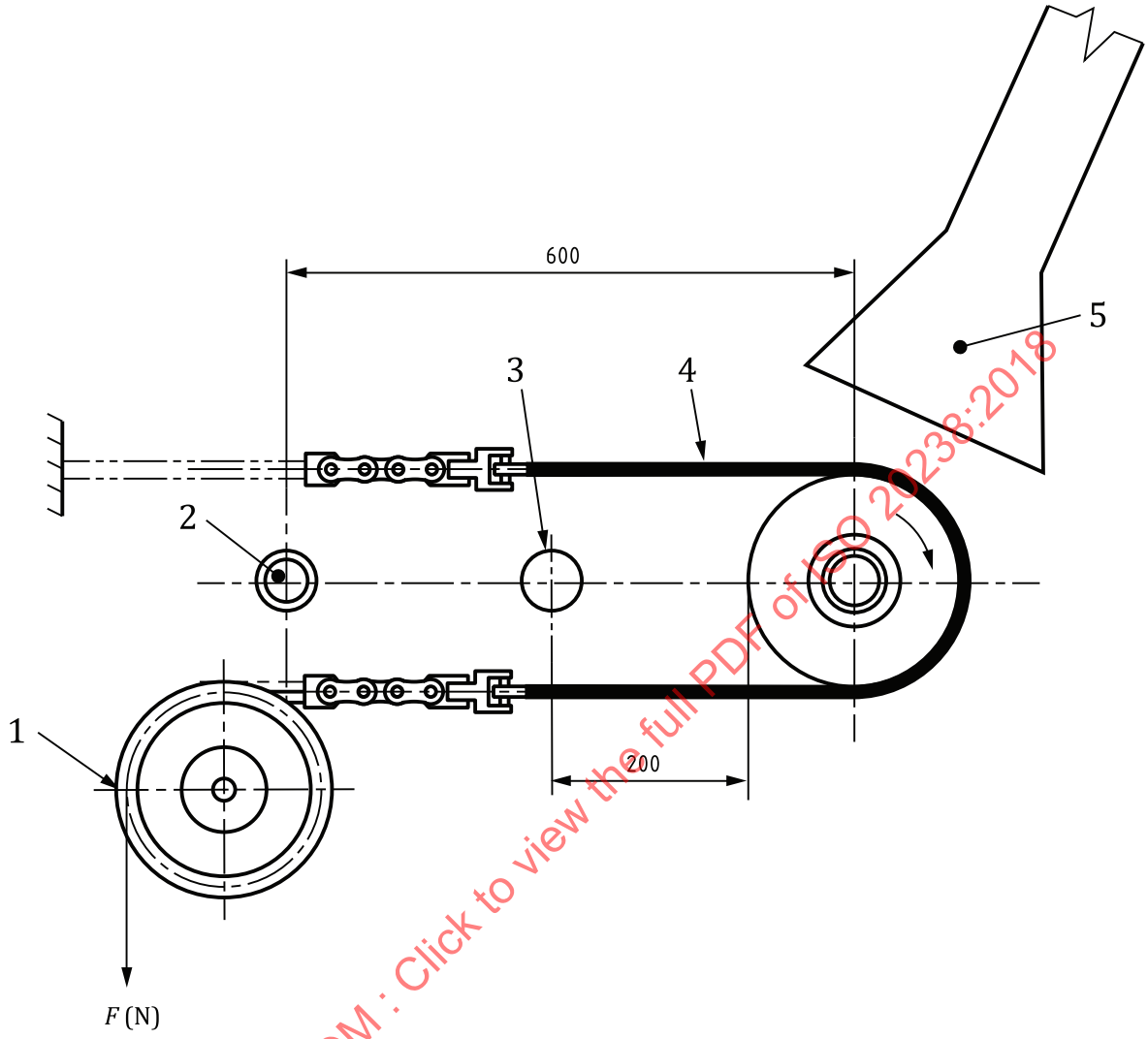
5.2 Mineral-insulated stainless steel sheathed thermocouple, having a maximum outside diameter of 2 mm and complying with EN 60584-1. It shall be used to determine the drum temperature. The tip of the thermocouple shall be set not more than 0,5 mm below the surface of the drum, midway along its length.

More than one thermocouple may be fitted in order to provide back-up in the event of failure.

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

Dimensions in millimetres

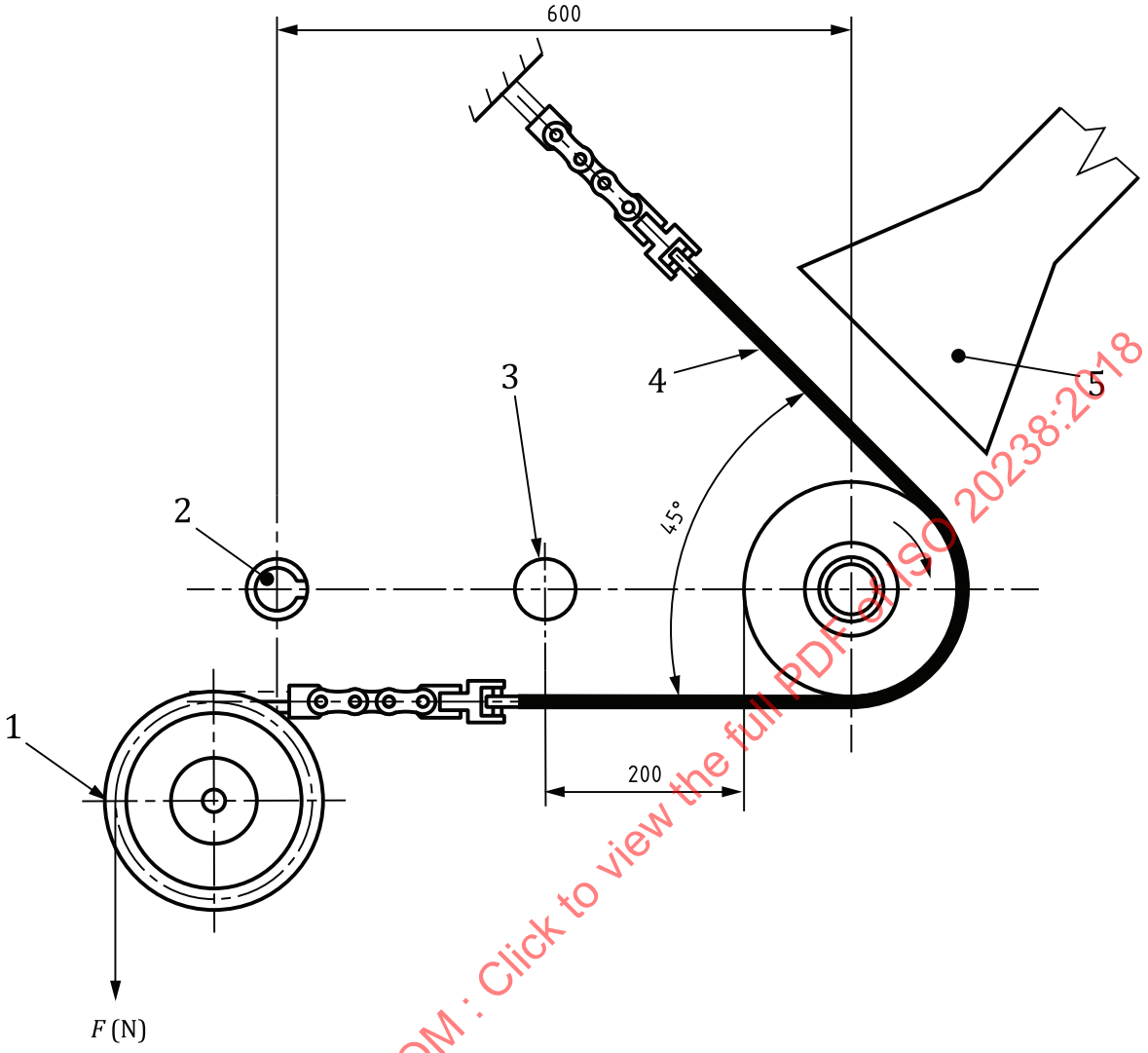


Key

1 guide pulley
2 perforated air supply pipe
3 anemometer
4 test piece
5 fume extraction hood

Figure 1 — Schematic arrangement of drum friction apparatus (standard arc of contact)

Dimensions in millimetres

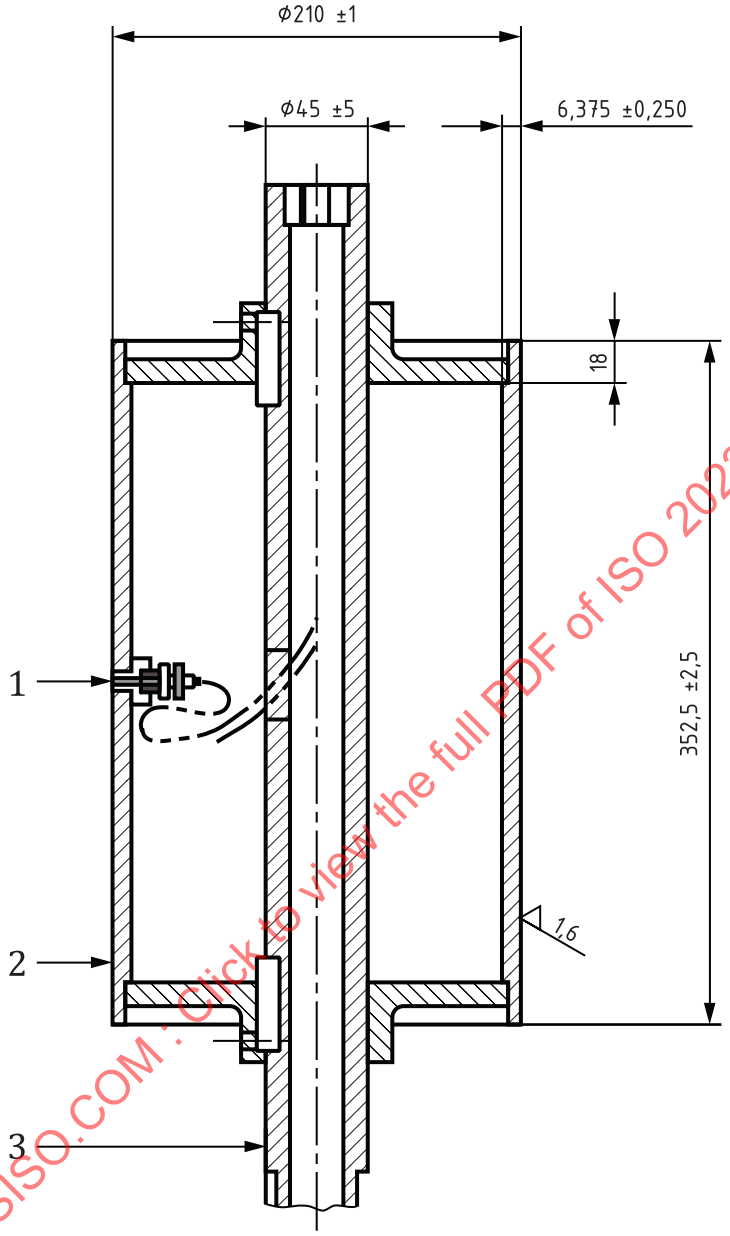


Key

1 guide pulley
2 perforated air supply pipe
3 anemometer
4 test piece
5 fume extraction hood

Figure 2 — Schematic arrangement of drum friction apparatus (reduced arc of contact)

Dimensions in millimetres



Key

1 temperature probe

2 outer shell manufactured from tube to ISO 9329-1 or ISO 9330-1

3 shaft

Figure 3 — Cross section of steel drum and thermocouple housing for drum friction test

5.3 Tensioning system, capable of applying the incremental tensions specified in 7.2.2 and 7.2.3.

5.4 Air current, having a velocity of (2,0 ± 0,1) ms^{-1} at a distance of 200 mm from the surface of the horizontal steel drum when the sample of 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 1,5 mm diameter at 10 mm pitch.

The distance between the centre line of the perforated pipe and the steel drum shall be 600 mm as shown in Figure 1 and Figure 2.

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.

5.5 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 %.

6 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 not less 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 (5.3). See Figure 1 and Figure 2.

7 Procedure

7.1 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.

7.2 Procedure and test

7.2.1 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 in accordance with Clause 6.

7.2.2 Method A — Tests in still air

7.2.2.1 General

Conduct one of the procedures in 7.2.2.2 to 7.2.2.5 (see also Table 1), as specified in the product or safety specification. Conduct two tests with the carrying side of the belt in contact with the steel drum (5.1) and two tests with the reverse side of the belt in contact with the steel drum.

7.2.2.2 Method A1.1 — 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°. Ensure that one end is rigidly secured and the other end attached to the tensioning system as shown in Figure 1. Apply a force of 343 N.

Rotate the drum at (200 ± 5) r/min in a direction away from the rigidly secured end of the test piece (i.e. 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.

Record the maximum surface temperature of the drum during the test.

