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Light conveyor belts — Determination of electrical resistances

Courroies transporteuses légères — Détermination des résistances électriques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 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 third edition cancels and replaces the second edition (ISO 21178:2013), which has been technically revised. The main changes compared to the previous edition are as follows:

— addition of terms and definitions;

— modifications to the figures and formulas;

— technical changes to the Clauses 5, 6 and 7;

— deletion of Annex A;

— editorial modifications.

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.

Light conveyor belts — Determination of electrical resistances

1 Scope

This document specifies test methods for determining the electrical resistances of light conveyor belts according to ISO 21183-1. The resistances are surface resistance, volume resistance perpendicular to the belt plane, and longitudinal and transverse volume resistance parallel to the belt plane. This document also specifies two test methods for determining the surface resistivity and the volume resistivity.

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 18573, *Conveyor belts — Test atmospheres and conditioning periods*

3 Terms and definitions

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

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/

3.1
electrical surface resistance
quotient of a direct-current voltage applied between two electrodes on the same surface of a test piece and the current between the electrodes

Note 1 to entry: It is expressed in ohms (Ω).

3.2
electrical surface resistivity
measured surface resistance calculated to apply to a square

Note 1 to entry: It is expressed in ohms (Ω) and the size of the square is immaterial.

3.3
electrical volume resistance
quotient of a direct-current voltage applied between two electrodes in contact with opposite faces of a test piece and the current between the electrodes, excluding current along the surface

Note 1 to entry: It is expressed in ohms (Ω).

3.4
electrical volume resistivity
measured volume resistance calculated to apply to a cube of unit side

Note 1 to entry: It is expressed in ohm metres (Ωm).

4 Symbols

Symbol	Description	Unit
R_{OA}	Electrical surface resistance, method A	Ω
R_{OB}	Electrical surface resistance, method B	Ω
R_{OG}	Electrical surface resistance for the determination of ρ_s	Ω
R_D	Electrical volume resistance perpendicular to the plane of the belt	Ω
R_{Di}	Electrical volume resistance in longitudinal and transverse direction parallel to the plane of the belt	Ω
ρ_s	Electrical surface resistivity	Ω
ρ_D	Electrical volume resistivity	Ωm
$d_{1/2/3}$	Diameter of electrode	mm
d_m	Middle of the gap diameter	mm
g	Width of the gap	mm
A	Surface of the electrode	mm^2
$h_{1/2}$	Thickness of test piece	mm

NOTE The SI unit of surface resistivity, ρ_s, is the ohm (Ω). In practice, this is sometimes referred to as "ohm/square" or "Ω/sq" . The size of the square is immaterial.

5 Electrical surface resistances

5.1 Method A: Measurement of surface resistance, R_{OA}, omni-directionally

5.1.1 Applicability

This method is applicable to belts which are electrically two-dimensionally isotropic in the plane of the belt.

5.1.2 Principle

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

5.1.3 Apparatus (see Figure 1)

5.1.3.1 Sheet of insulating material, a little larger than the test piece.

5.1.3.2 Two cylindrical and coaxial electrodes (see Figure 1), with contact surfaces machined flat and polished, as follows.

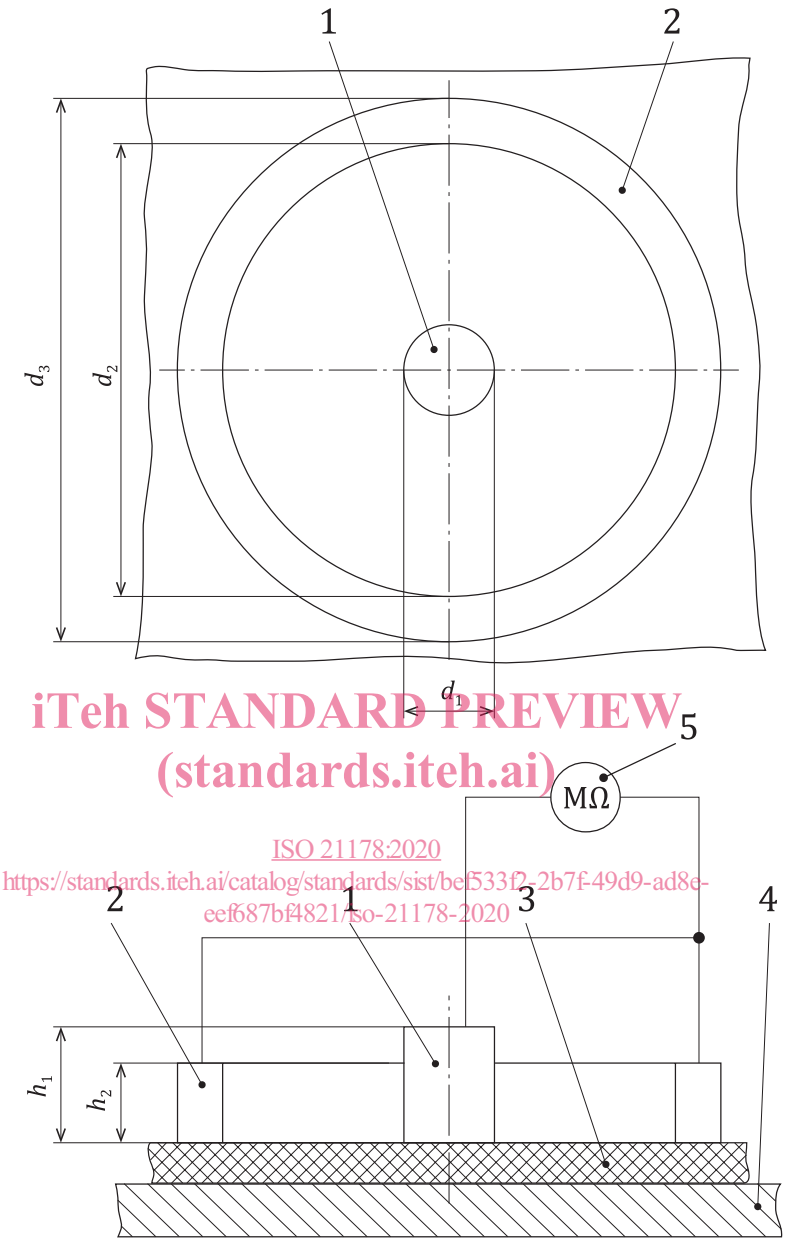
5.1.3.2.1 Electrode 1, circular.

5.1.3.2.2 Electrode 2, annular.

5.1.3.2.3 Material of electrodes, either brass or stainless steel.

5.1.3.3 Ohmmeter, having a measuring range up to 10^{10} Ω and accurate to within ±5 %.

5.1.3.4 Source of direct current, adjustable up to 500 V, and not permitting a current greater than 10 mA.



Key

1 electrode 1
2 electrode 2
3 test piece
4 sheet of insulating material
5 ohmmeter

Figure 1 — Test arrangement for measurement of electrical surface resistance R_{OA}

5.1.4 Test piece

5.1.4.1 Material

Test piece material shall be new, unused ("virgin"), but shall not be tested sooner than five days after manufacture. It shall be free from contamination and superficial damage.

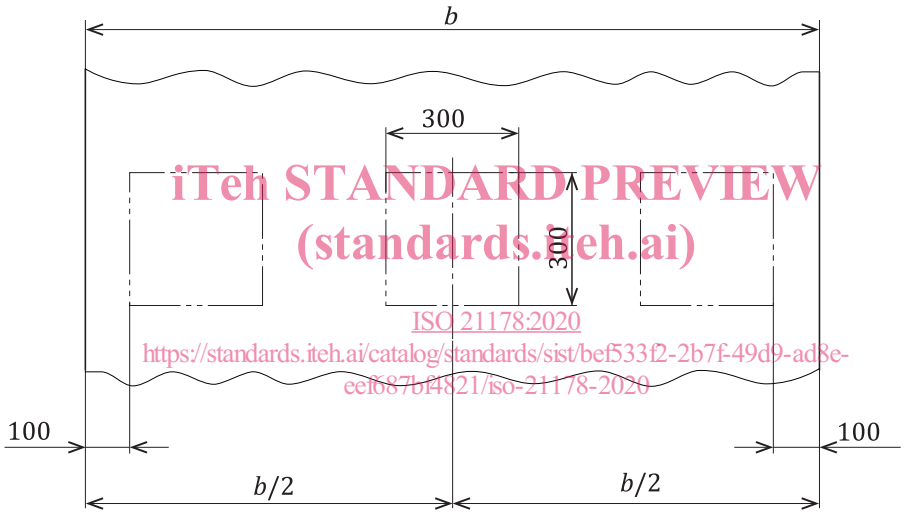
5.1.4.2 Dimensions

The test pieces shall be square, 300 mm × 300 mm minimum, and shall be cut from the full thickness of the belt.

5.1.4.3 Number

Three test pieces shall be taken. One test piece shall be taken from the middle of the belt, the other two test pieces shall be taken in the area between 100 mm to 400 mm from each of the belt edges. The test pieces shall be selected in accordance with Figure 2.

Dimensions in millimetres



Key

b belt width

Figure 2 — Distribution of test piece selection

5.1.4.4 Cleaning

If necessary, clean both surfaces of the test pieces by rubbing with fuller's earth (hydrated magnesium-aluminium 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.

5.1.4.5 Conditioning

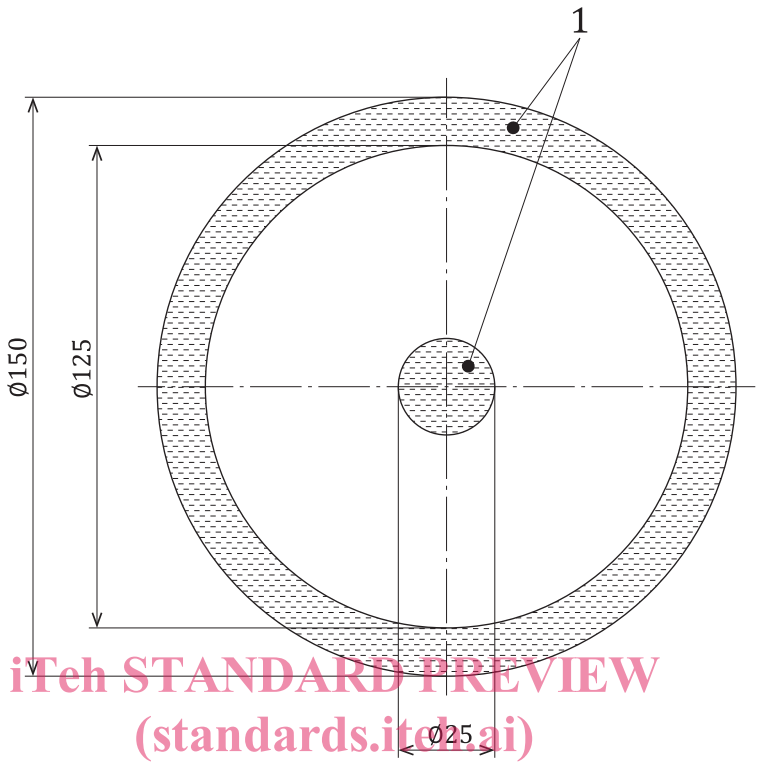
Before testing, condition the test pieces in accordance with ISO 18573, Atmosphere B, for 24 h, except that, if the light conveyor belt consists of materials with a high absorption of moisture, for example cotton or polyamide, condition the test piece for 48 h.

5.1.4.6 Preparation

To ensure good contact between electrodes and test piece a contact medium as described in 5.1.4.7 can be used if necessary.

If contact medium is used, paint two areas of the test piece as shown in Figure 3. Take care to ensure the accuracy of the dimensions of the painted areas, although the symmetry of the centre is not critical.

Dimensions in millimetres



Key

1 contact medium

Figure 3 — Design to be painted on the test piece

5.1.4.7 Contact medium

The electrical surface resistivity of the contact medium shall not be higher than 10^4 Ω. For checking this value, use the same electrode arrangement as described in Clause 6. Examples for suitable contact media are silver lacquer or a jelly.

NOTE A jelly having the following composition is suitable:

— Anhydrous polyethylene glycol of molecular mass 600: 800 parts by mass;

— Water: 200 parts by mass;

— Potassium chloride: 10 parts by mass;

— Soft soap (pharmaceutical quality): 1 part by mass.

5.1.5 Procedure

The temperature and relative humidity in the test room shall be in accordance with ISO 18573, Atmosphere B.

Measure the temperature and relative humidity in the test room.

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