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Light conveyor belts — Determination of the electrostatic field generated by a running light conveyor belt

Courroies transporteuses légères — Détermination du champ électrostatique engendré par une courroie transporteuse légère en marche

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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.

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 21179 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 3, *Conveyor belts*.

This second edition cancels and replaces the first edition (ISO 21179:2005), of which it constitutes a minor revision.

Light conveyor belts — Determination of the electrostatic field generated by a running light conveyor belt

1 Scope

This International Standard specifies a test method for the determination of the electrostatic field generated by a running light conveyor belt according to ISO 21183-1.

This dynamic procedure is required because the antistatic behaviour of light conveyor belts cannot in many cases be sufficiently described by measurement of the electrical resistances in accordance with ISO 21178.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to its application. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22, *Belt drives — Flat transmission belts and corresponding pulleys — Dimensions and tolerances*

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

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

ISO 21181, *Light conveyor belts — Determination of the relaxed elastic modulus*

3 Principle

The test piece is run under specified conditions and produces an electrostatic field, the variation of which is recorded with time.

The test is carried out successively with both sides of the belt in contact with the pulleys.

4 Apparatus (see Figure 1)

4.1 Pair of pulleys, as follows:

a) electrically connected and earthed;

b) made of steel;

c) diameter 200 mm or larger, rim width 120 mm;

d) raw, unplated surface roughness, maximum Ra = 1,6 µm, in accordance with ISO 4287;

e) final coating of chromium plating;

f) drive pulley, fixed, cylindrical;

g) driven pulley moveable for tensioning, crowned in accordance with ISO 22 (h = 0,6 mm).

4.2 Tensioning device, such that the test piece can be loaded according to the relevant $k_{1\,\%}$ value given in Table 1 to achieve uniform surface pressures.

Table 1 — Shaft load required

Modulus of elasticity $k_{1\,\%}$[a] N/mm	Shaft load F N
$k_{1\,\%} \leq 2{,}5$	50
$2{,}5 < k_{1\,\%} \leq 10$	300
$10 < k_{1\,\%} \leq 30$	900
$k_{1\,\%} > 30$	As per agreement
[a] The value of $k_{1\,\%}$ shall be established in accordance with ISO 21181.	

4.3 Drive, such that the belt runs directly from the drive pulley to the measuring device at a speed of 5 m/s.

4.4 Measuring device, either an electrostatic field meter with signal output that gives readings of the electrostatic field strength, E, in volts per metre, or a device that gives a direct reading of the surface potential, U, in volts.

4.5 Recording device, e.g. y/t recorder.

4.6 Means of correction for electrostatic fields

4.6.1 Earthed steel plate equipping the electrode, 200 mm × 200 mm, with the edges bent up with a radius of approximately 10 mm, to correct field distortion created by the measuring electrode. The lower surface of the electrode shall be flush with the lower surface of the steel plate. The size and shape of the perforation of the steel plate shall be adapted to the shape of the electrode used. The gap between the electrode and the steel plate shall not exceed 2 mm (see Figure 1).

4.6.2 Earthed steel plate, 600 mm × 200 mm, with the edges bent up with a radius of approximately 10 mm (see Figure 1), to shield the field to be measured from the field distortion generated by the return side of the test piece.

5 Test piece

5.1 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.

5.2 Dimension

The test piece shall have an endless length of (2 500 ± 50) mm and a width of (100 ± 1) mm.

5.3 Endless joining

The test piece shall be joined endlessly according to the manufacturer's instructions.

5.4 Conditioning

Before testing, condition the test pieces in accordance with ISO 18573, Atmosphere B, for 24 h, except that for high-conductivity belts, the relative humidity may be reduced to (25 ± 5) %.

6 Procedure

Test conveyor belts which, due to their construction, require pulley diameters of more than 200 mm, with the smallest diameter possible and according to the manufacturer's instructions.

Measure the temperature and relative humidity in the test room.

Clean both pulleys (4.1) and, if necessary, remove any dust from the shielding steel plates (4.6.1 and 4.6.2).

After endlessly joining and conditioning of the test piece, install it on the testing apparatus with the normal running side in contact with the pulleys.

Tension the test piece in accordance with 4.2.

Install the recording device (4.5).

Position the measuring device (4.4) on the centre line of the test piece, 500 mm from the centre of the drive pulley, with a distance of 10 mm to 100 mm between the measuring device and the test piece surface not in contact with the pulley (see Figure 1).

NOTE Experience has shown that a distance of 25 mm is preferable.

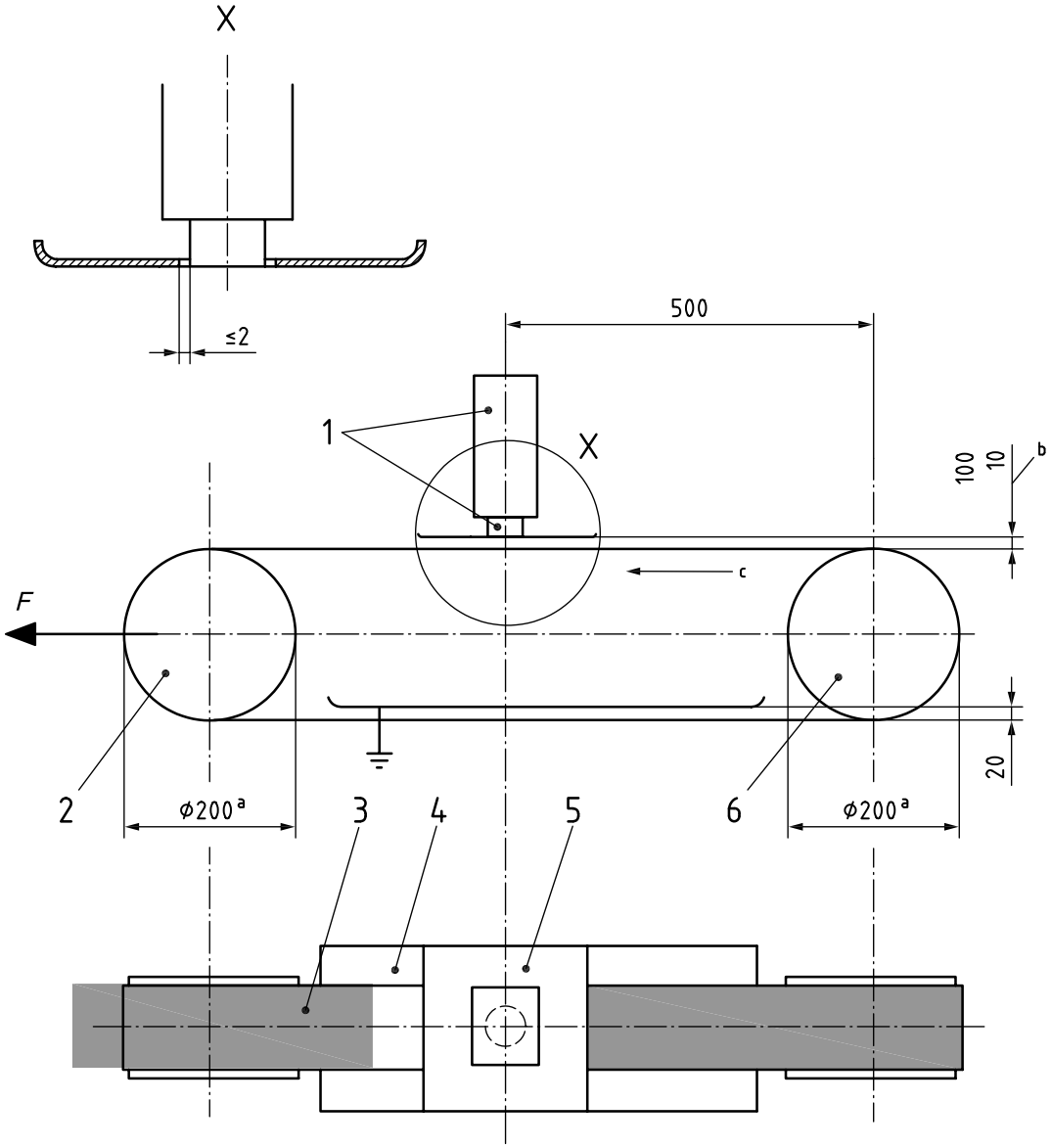
Start the test piece and run it from the drive pulley (4.3) directly to the field measuring device.

Either record the electrostatic field strength, E, in volts per metre or, if the measuring device used gives a direct reading of the surface potential, U, record that value, in volts.

The measurement time shall be 30 min.

Repeat the same procedure with the other side of the belt in contact with the pulleys.

Dimensions in millimetres



Key

1 measuring device with electrode
2 driven pulley, movable, crowned
3 test piece, endless (2 500 ± 50) mm × (100 ± 1) mm
4 earthed steel plate, 600 mm × 200 mm
5 earthed steel plate, 200 mm × 200 mm
6 drive pulley, fixed, cylindrical

a Diameter 200 mm or larger; see Clause 6.
b Measuring distance of test piece surface not in contact with pulleys shall be between 10 mm and 100 mm.
c Direction of run.

Figure 1 — Basic arrangement of test bench for measurement of electrostatic field strength generated by running light conveyor belt

7 Expression of results

The two significant results within the test period shall be, firstly, the maximum value reached and, secondly, a value judged to be constant (i.e. when a change over the final 10 min is less than 10 %). Either the two values of these electrostatic field strengths shall be recorded or, if the measuring device used gives a direct reading of the surface potential, the two values of these surface potentials shall be recorded.

If the electrostatic field strengths are recorded, the surface potential, U, in volts, shall be calculated using the following formula:

$$U = E \times a$$

where a is the distance, in metres, between the measuring electrode and the conveyor belt surface.

These results are valid for virgin material according to 5.1.

If more than one measurement on one side is carried out (several measurements on one test piece or several test pieces), the arithmetic mean of the individual values either of E (calculated) or U (direct reading) shall be taken. All of the values shall be recorded.

8 Test report

The test report shall include the following information:

a) complete designation of the tested conveyor belt material and date of manufacture;

b) $k_{1\ \%}$ value of the test piece(s);

c) reference to this International Standard, i.e ISO 21179, and any necessary exceptions;

d) places from which the test piece(s) were taken;

e) test room temperature and relative humidity;

f) conditioning period;

g) the shaft load, in newtons;

h) indication of belt side in contact with the pulleys;

i) the values of U in accordance with Clause 7;

j) date of test.

Bibliography

[1] ISO 21178, *Light conveyor belts — Determination of electrical resistances*

[2] ISO 21183-1, *Light conveyor belts — Part 1: Principal characteristics and applications*

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