INTERNATIONAL STANDARD

ISO 22751

First edition
2020-08

Rubber- or plastic-coated fabrics — Physical and mechanical test — Determination of bending force

Supports textiles revêtus de caoutchouc ou de plastique — Essai physique et mécanique — Détermination de la force de flexion

Reference number
ISO 22751:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 45, *Rubber and rubber products* Subcommittee SC 4, *Products (other than hoses)*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 248, *Textiles and textile products*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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.

Rubber- or plastic-coated fabrics — Physical and mechanical test — Determination of bending force

1 Scope

This document specifies a test method for the determination of the bending force of rubber or plastics-coated fabrics.

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 2231:1989, *Rubber- or plastics-coated fabrics — Standard atmospheres for conditioning and testing*

ISO 2286-3, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 3: Method for determination of thickness*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

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
bending force
force exerted by the specimen on the measuring bar at a specified *bending angle* (3.2), *bending length* (3.3) and *bending rate* (3.4)

3.2
bending angle
angle at which the *bending force* (3.1) is measured

3.3
bending length
length around which the specimen is bent

Note 1 to entry: The bending length is the distance between the clamping device of the specimen and the bar onto which the force of the specimen is transferred.

3.4
bending rate
rate of bending of the specimen

3.5
compression-bending
compression of the coating layer during bending

3.6
extension-bending
extension of the coating layer during bending

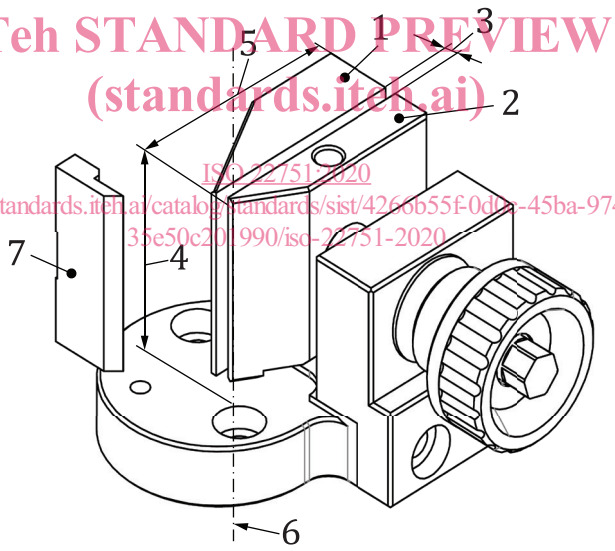
4 Principle

The bending force is determined based on the bar method/two-point method. In this method, the specimen is clamped in a rotating fixture. During the rotation, the specimen exerts a force onto a bar. The force acting at a specified bending angle is measured.

5 Apparatus

5.1 A device for determining the bending force according to the bar method (two-point bending method) comprising the following.

5.1.1 A clamping mechanism in which the specimen shall be able to be clamped vertically. The clamping jaws shall have a depth of (35 ± 1) mm and a minimum width of at least 30 mm (see Figure 1). The clamping device shall enable parallel clamping with an even pressure distribution on the specimen. It shall move smoothly and allow tightening at known clamping pressure, i.e. by torque wrench or any other adapted method. The clamping device shall allow for affixing the specimen without it touching the bar in its initial position.



Key
1 fixed clamping jaws
2 moving clamping jaws
3 aperture > 6 mm
4 jaw width > 30 mm
5 jaw depth (35 ± 1) mm
6 pivot axis
7 vertical metering bar

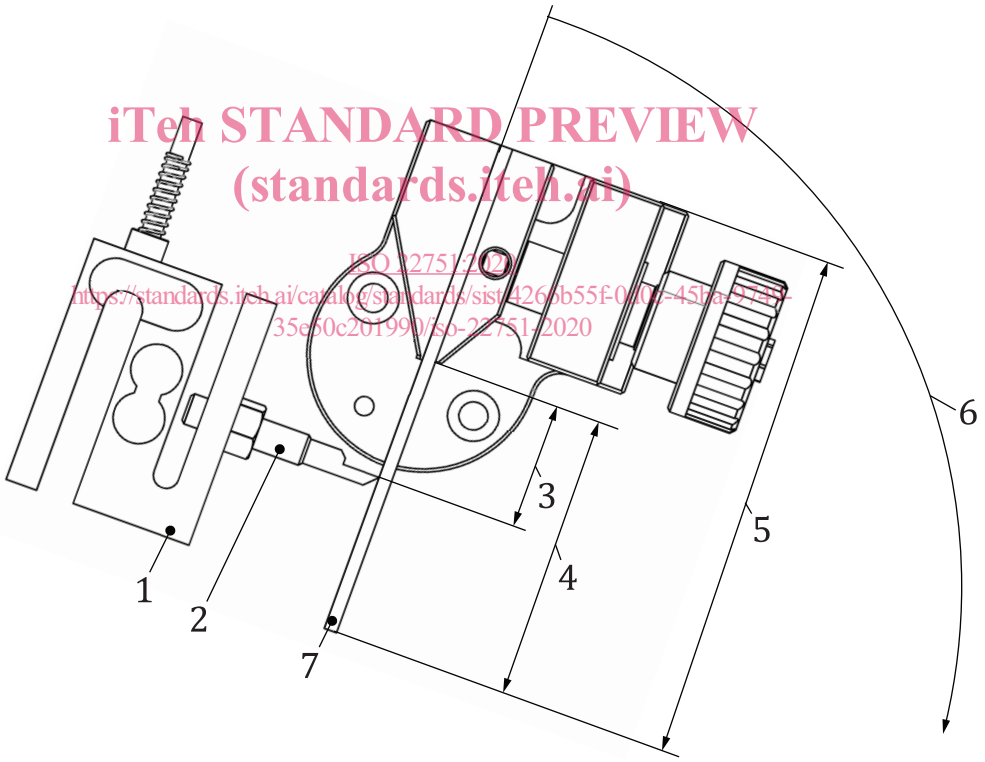
Figure 1 — Clamping jaws

5.1.2 A means of rotating the clamping device about the pivot axis. The pivot axis is located exactly at the front edge of the fixed clamp (deviation of ± 0,1 mm; see Figure 1). Rotation shall be possible within

the range of 1 to 91° with a maximum deviation of 1,5 %. The rotational speed shall be able to be adjusted up to 10°/s with an accuracy of 0,1°/s. At maximum load, the maximum deviation of the rotational speed allowed is 1 %.

5.1.3 A means of measuring the bending force (see Figures 2 and 3). The rotation of the specimen causes it to be pressed against a vertical bar. The bar is connected to a load cell that allows measurement of forces up to 10 N (optionally, 1 N for very flexible materials) with an accuracy as specified by class 2 of ISO 7500-1. The main axis of the load cell shall be aligned horizontally. The bar design shall exhibit a sharp edge (R = 0,05 mm ± 0,01 mm) and a width of at least 30 mm. The weight of the bar shall not influence the measured value by more than 1 % of its reading.

The distance between the bar and the pivot point shall be adjustable in a range from 0,1 mm to 50 mm with an accuracy of at least 0,1 mm. At the start of the measurement, the specimen is moved towards the bar until contact is made and a defined preliminary force is reached. This preliminary force shall be able to be adjusted with an accuracy of at least 1 mN. When the preliminary force is reached, the measurement shall start, i.e. angle = 0° and force = preliminary force setting. The evaluation unit shall ensure measurement of the force at one or more previously defined angles. These angles shall not be identical to the maximum angle of rotation. The measuring apparatus shall ensure that all significant parameters (force, length and speed) can be checked, calibrated and restored. It is recommended that the measured data (raw data and parameter settings) are able to be electronically archived.



Key

1 load cell
2 vertical metering bar
3 bending length – adjustable
4 free sample length
5 sample length
6 rotating direction
7 sample

Figure 2 — Clamping jaws with specimen, load cell and bar with sharp edge

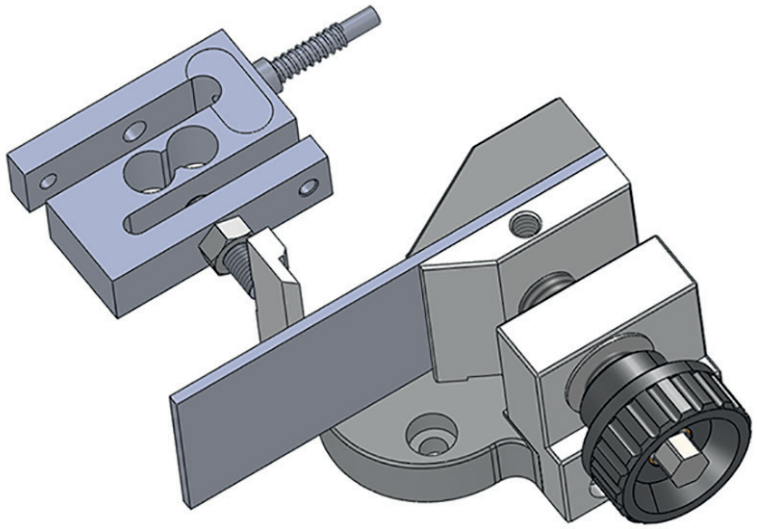


Figure 3 — 3 D drawing of clamping jaws with specimen, load cell and bar

5.2 Torque wrench suitable for a range from 0,05 Nm to 0,2 Nm with an accuracy of 0,01 Nm.

6 Sampling and sample preparation

From the product to be tested, take rectangular test specimens of dimensions taken from the relevant parameter sets (see Table 1). Other dimensions are permissible but shall be indicated in the test report. Cut at least three test specimens from the sheet longitudinal to the direction of manufacture and at least another three test specimens perpendicular to the direction of manufacture. If the direction of manufacture is unknown, the directions for cutting should be agreed between the interested parties. Other sampling angles (e.g. diagonal) are also permissible and details shall be given in the test report.

Define and mark clearly the side which extended-during the test. This side is pressed by the bar during the test.

If bending tests on both sides are to be conducted on the material, an additional three specimens shall be used for each sampling direction.

7 Atmosphere for conditioning and testing

7.1 For conditioning

The atmosphere shall be the method of conditioning “1” specified in ISO 2231:1989, 6.1. For fabrics coated on one side only, a minimum exposure shall be at least 16 h. For fabrics coated on both sides, a minimum exposure shall be at least 24 h.

7.2 For testing

The atmosphere shall be selected from atmospheres “A” to “E” as specified in ISO 2231:1989, Clause 5. If it is necessary to control both temperature and humidity, select from atmospheres “A” to “C”.

NOTE The temperature 23 °C is normally the testing atmosphere in temperate countries and 27 °C is normally in tropical and subtropical countries.

8 Test procedure

8.1 Bending force

8.1.1 General

Each specimen shall be tested only once and shall then be discarded. The specimen shall be carefully clamped into the test device such that the free-standing part of the specimen corresponds to the clamping length specified in Table 1. The marked side shall be pressed by the bar during the test. A torque wrench with a setting of 0,08 Nm shall be used to tighten the clamping jaws. Then, the test shall be started with one of the specified parameter sets, given in Table 1. If no set is specified, use set A as standard set. The measurement starts at 0° when the specified preliminary force is reached. The measured forces shall be recorded at the required bending angle.

8.1.2 Specimen coated on both sides

When the specimen has both sides' surfaces coated, indicate clearly which side is pressed by the bar. Both extension- and compression-bending are possible. For the extension-bending test, the specimen shall be inserted so that the bar presses on the marked side. To make the compression-bending test of the marked side, the specimen shall be inserted so that the bar presses on the non-marked side.

The coating layers on both sides can consist of the same material and have the same thickness. To get a full set of information, it is recommended that extension- and compression-bending tests of the marked side are conducted because in such cases, the results of the tests with extension and compression of the marked side can be different.

8.1.3 Specimen coated on one side

Both extension and compression-bending on the coated side is possible. For the extension-bending test, the specimen shall be inserted so that the bar presses on the coated side. To make the compression-bending test, the specimen shall be inserted so that the bar presses on the uncoated side.

Table 1 — Set of parameters

	Set of parameters		
	A (standard)	B	C
bending length, in mm	5	10	15
free sample length, in mm	15	20	25
measurement in bending angle of, in °	60	60	60
bending up to an angle of, in °	63	63	63
bending rate, in °/s	1,5	1,5	1,5
bending rate up to preliminary force, in °/s	1,5	1,5	1,5
dimensions of sample (width x length), in mm	30 × 50	30 × 55	30 × 60
preliminary force, in mN	3	3	3

8.2 Thickness

Measure the total thickness of the material in accordance to ISO 2286-3. The same specimens used for the measurement of flexural properties can be used. In this case, thickness shall be measured after the measurement of flexural properties.