INTERNATIONAL STANDARD

ISO 4674-2

Second edition
2021-10

Corrected version
2021-11

Rubber- or plastics-coated fabrics — Determination of tear resistance —

Part 2: Ballistic pendulum method

Supports textiles revêtus de caoutchouc ou de plastique — Détermination de la résistance au déchirement —
Partie 2: Méthode au pendule balistique

Reference number
ISO 4674-2:2021(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).

This second edition cancels and replaces the first edition (ISO 4674-2:1998), which has been technically revised. The main changes compared with the previous edition are as follows:

— in Clause 5, the title has been changed to "Apparatus and reagents" and 5.3, 5.4, and 5.5 have been added;

— in Clause 6, the title has been changed to "Sampling and preparation of test pieces" and Clause 5 has been integrated;

— in Clause 7, the test duration has been specified;

— in Clause 8, the title has been changed to "Atmosphere for conditioning and testing" and 8.2 has been added;

— in Clause 9, the wet test has been specified.

This corrected version of ISO 4674-2:2021 incorporates the following corrections:

— "Dimensions in millimetres" has been added to Figure 1.

A list of all parts in the ISO 4674 series can be found on the ISO website.

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.

Introduction

Tearing is amongst the more usual ways of destruction for many thin materials such as paper, coated or uncoated textiles, plastics films and leather. Knowledge of the resistance of these materials to this type of behaviour is therefore very important.

In practice, tearing can result from very different circumstances; hence the large number of test methods that have been developed in order to predict the behaviour of materials in various situations.

The ISO 4674 series deals with initiated tearing, i.e. the propagation of a tear from an initiating cut. It consists of the following two parts:

— *Part 1: Constant rate of tear methods*

— *Part 2: Ballistic pendulum method*

ISO 4674-1 describes two methods using a tensile-testing machine at constant rate of elongation.

This document describes a dynamic method using the kinetic energy of a falling pendulum.

Other methods, e.g. the “wounded burst test”, are under consideration as possible further parts.

Rubber- or plastics-coated fabrics — Determination of tear resistance —

Part 2:
Ballistic pendulum method

WARNING — Persons using this document should be familiar with laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This document specifies a method for the determination of tear resistance based on the action of an active force applied to a notched test piece.

The test can be carried out on:

— test pieces that have been conditioned in a standard atmosphere; or

— test pieces that have undergone pre-treatment, e.g. water immersion.

The results obtained by this method cannot be compared with those obtained by methods involving constant rate of tear.

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 2286-2, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate*

3 Terms and definitions

No terms and definitions are listed in this document.

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 http://www.electropedia.org/

4 Principle

A sudden force is applied to a notched test piece. This force is generated by a pendulum. The amplitude of the first oscillation enables the tearing force to be measured.

5 Apparatus and reagents

5.1 Test machine of the pendulum type, in which the test piece is held between two jaws, one movable and the other fixed, the clamping faces of which shall be in the same plane when the apparatus is in its starting position. The moving jaw is attached to a pendulum which can fall under the influence of gravity.

5.1.1 Rigid framework, supporting the pendulum and the fixed jaw, as well as the knife and measuring device.

It is fitted with a level and positioned to prevent any movement during the test, e.g. by securing it by means of threaded bolts on a rigid table.

5.1.2 Pendulum, which is free to swing about a horizontal axis on roller bearings, with means for holding the pendulum in the raised starting position and releasing it instantly. The weight of the pendulum may be altered by adding additional masses or by exchanging pendulums, thus giving the possibility of several measuring scales.

5.1.3 Mechanical or electronic device, for determining the maximum amplitude of the first swing, and thus, the energy used to tear the test piece. The reading may be given directly in terms of tearing force.

5.1.4 Movable jaw, integral with the pendulum, and **fixed jaw**, integral with the framework.

These jaws shall be 2,8 mm ± 0,3 mm apart in order to permit the passage of the knife.

When the pendulum is in its starting position, the clamping faces of the jaws shall be in the same plane, perpendicular to the plane of swing of the pendulum. The jaws shall be so aligned that the test piece lies in a vertical plane parallel to the axis of the pendulum. The distance between the clamping line of the jaws and the pendulum axis shall be 104 mm ± 1 mm. The plane containing the clamping line and the axis of the pendulum shall make an angle of 27,5° ± 0,5° to the perpendicular.

The surface state of the clamping faces and the force applied to the jaws shall permit the test pieces to be held without slipping. Closing of the jaws may be achieved by pressure systems. The dimensions of the clamping faces are not critical. A width of 30 mm to 40 mm and a height of 15 mm to 20 mm have been found to be suitable.

5.1.5 Knife, to begin the tear in the test piece by cutting a slit mid-way between the two jaws. Additional information on adjusting and calibrating the apparatus is given in Annex A.

5.2 Hollow punch or template, for cutting out the test pieces.

5.3 Equipment, in which the test pieces can be immersed in water prior to wet testing.

5.4 Distilled or deionized water, for wetting out the test pieces.

5.5 Wetting agent or surfactant.

6 Sampling and preparation of test pieces

6.1 Sampling

Samples shall be cut in such a way as to be as representative as possible of the batch being examined.

The test pieces shall be cut from the usable width of the coated fabric in accordance with ISO 2286-2 and from the full length of the roll.

For tests for tearing in the longitudinal direction, the test pieces shall be selected so that their length is perpendicular to the longitudinal edge of the coated fabric. For tests for tearing in the transverse direction, the test pieces shall be selected so that their length is parallel to the longitudinal edge of the coated fabric.

For coated woven or knitted textiles, care shall be taken to divide the test pieces so that the same warp yarn or weft yarn, or the same column or row of knitting, is not found in more than one test piece for the same direction to be tested.

6.2 Test pieces

6.2.1 Shape and dimensions

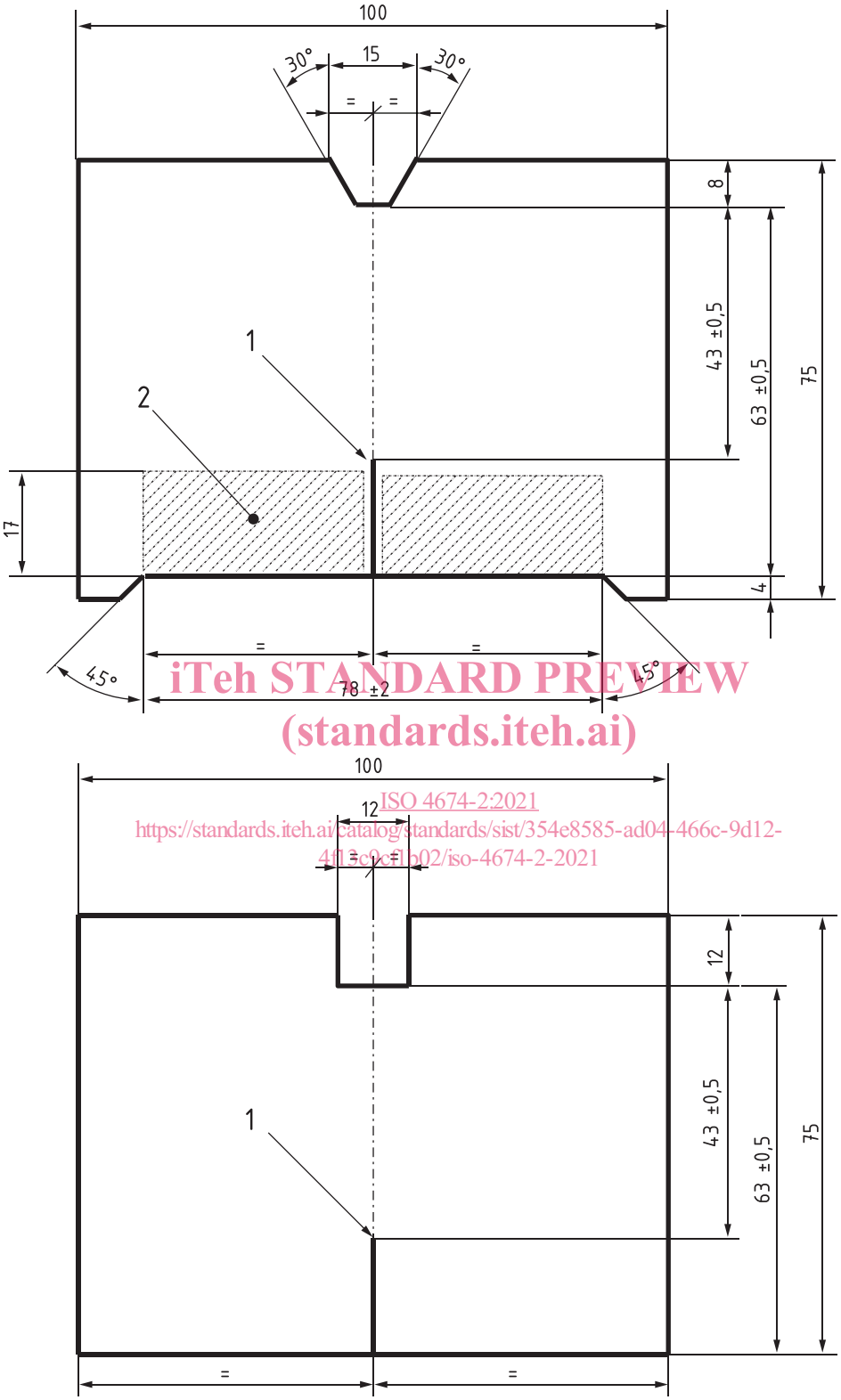
Cut out test pieces using a hollow punch or template, preferably of one of the designs shown in Figure 1. Test pieces of different shapes and dimensions may, however, also be used, provided that:

— the length to be torn is 43 mm ± 0,5 mm;

— a notch between 5 mm and 15 mm is made in the upper edge in order to prevent the last threads from fraying;

— the width and general shape of the test pieces are such that none of the torn parts rub against the framework or the pendulum.

Dimensions in millimetres



Key

1 incision
2 position of jaws

Figure 1 — Test piece designs