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

**Part 1:  
Constant rate of tear methods**

*Supports textiles revêtus de caoutchouc ou de plastique —  
Détermination de la résistance au déchirement —*

*Partie 1: Méthodes à vitesse constante de déchirement*

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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 4674-1 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

Together with part 2 (see below), this part of ISO 4674 cancels and replaces ISO 4674:1977, which has been technically revised.

ISO 4674 consists of the following parts, under the general title *Rubber- or plastics-coated fabrics — Determination of tear resistance*:

- *Part 1: Constant rate of tear methods*
- *Part 2: Ballistic pendulum method*

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## Introduction

Tearing is amongst the more usual ways of destruction for many thin materials such as paper, coated or uncoated textiles, plastic 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 present International Standard 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.

The first part describes two methods using a tensile-testing machine at constant rate of elongation. The second part describes a dynamic method using the kinetic energy of a falling pendulum.

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

## Part 1: Constant rate of tear methods

**WARNING** — Persons using this part of ISO 4674 should be familiar with normal laboratory practice. This part of ISO 4674 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 part of ISO 4674 describes two methods for determining the forces necessary to initiate and propagate tearing of a coated fabric using the constant rate of tear method. The methods described are:

- method A: tongue tear;
- method B: trouser tear.

### 2 Normative references

The following referenced documents are indispensable for the application 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 1421:1998, *Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break*

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

ISO 2286-1:1998, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 1: Methods for determination of length, width and net mass*

ISO 2602:1980, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

### 3 Terms and definitions

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

#### 3.1

##### **peak**

point on an autographic trace where the gradient, relative to the force values recorded, changes from positive to negative

**NOTE** For tear recordings, a peak to be used for calculation is defined by a drop in force of at least 10 % of the last increasing force value.

3.2

**length of tear**

measured length of a tear produced by a tearing force from the initiation of the force until its termination

**4 Apparatus**

**4.1 Constant rate of extension tensile-testing machine**, complying with ISO 1421. The width of each jaw shall be not less than the width of the portions of the test piece to be clamped, i.e.  $\geq 150$  mm and  $\geq 50$  mm for a tongued test piece,  $\geq 50$  mm for a normal trouser test piece and  $\geq 100$  mm for a large trouser test piece (half of 200 mm). Tear forces shall be recorded by an autographic recorder. If recording of force and extension is obtained by means of data-acquisition boards and software, the frequency of data collection shall be not less than  $8 \text{ s}^{-1}$ .

NOTE For method B, the jaws need to be twice as wide as the width of the portion to be clamped. This is necessary to ensure that the two legs are positioned as shown in Figure 6 with the edges of each leg correctly aligned with the axis of force application.

**5 Atmospheres for conditioning and testing**

The atmospheres for conditioning and testing shall be in accordance with those in ISO 2231.

If tests are to be made on wet test pieces, totally immerse them for a minimum of 1 h at the temperature selected for testing from ISO 2231 in an aqueous solution of a wetting agent of concentration not more than 1 % by mass. Thoroughly rinse in water and test within 1 min of removal from the water.

The minimum time lapse between manufacture and testing shall be 16 h.

**6 Method A — Tongued (double-tear) test piece**

**6.1 Selection and preparation of test pieces**

Select ten test pieces, each 200 mm long  $\times$  150 mm wide. Select five test pieces in the longitudinal direction and five in the transverse direction, from the full usable width and length of the sample (see ISO 2286-1).

Select test pieces for tearing in the transverse direction (i.e. tearing across longitudinal or warp threads in the case of woven substrates) so that their width is parallel to the longitudinal edge of the coated fabric.

Select test pieces for tearing in the longitudinal direction (i.e. tearing across transverse or weft threads in the case of woven substrates) so that their width is perpendicular to the longitudinal edge of the coated fabric.

In each test piece, cut a tongue measuring 100 mm  $\times$  50 mm as shown in Figures 1 and 2. Across each face of the test piece, mark a line ABCD at a distance of 50 mm from the end of the tongue as illustrated in Figure 2.

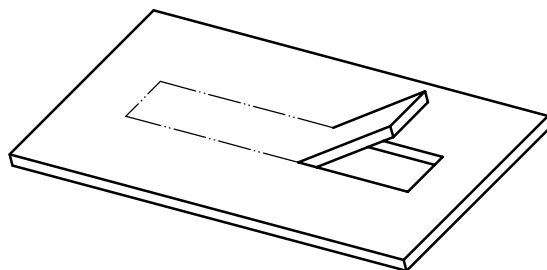
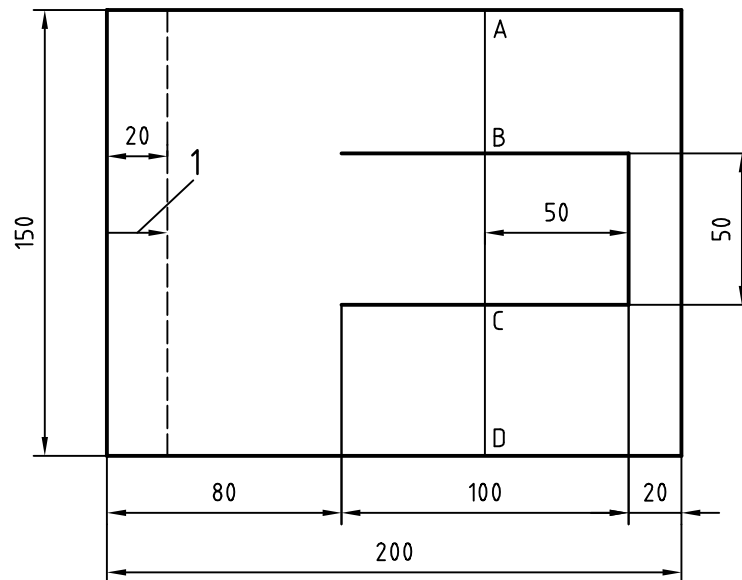


Figure 1 — Principle of tongued test piece



Dimensions in millimetres

**Key**

1 mark indicating end of tear

**Figure 2 — Dimensions of tongued test piece**  
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Mark the end of the tear 20 mm from the uncut end in the middle of the strip to indicate the position of the tear at the completion of the test.

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**6.2 Procedure**

Adjust the test machine to give a rate of jaw traverse of  $(100 \pm 10)$  mm/min, and select the appropriate load capacity range. Engage and zero the autographic recorder. Adjust the jaw separation to 100 mm.

Clamp the tongue of the test piece centrally and symmetrically in the jaw so that the line BC is just visible, as illustrated in Figure 3. Clamp the legs of the test piece symmetrically in the other jaw of the machine so that the lines AB and CD are just visible and the legs of the test piece are parallel to the tearing force.

Set the test machine in motion at the specified rate of traverse and stop the test after 60 mm of the test piece has been torn, i.e. at the termination line.

Observe if the tear does not proceed along the direction of force and whether any threads slip out from the fabric rather than being torn. The test is to be considered correct if no slippage occurs in the jaws, no delamination takes place between coating and base fabric during the test and the tear proceeded and was completed along the direction of application of the force. Other results shall be rejected.

If three or more test pieces have to be rejected, consider the method as unsuitable.

**NOTE** In this case, and if the test has been performed with normal test pieces, the tear resistance may be assessed either by using another method, e.g. Part 2 of this International Standard, or by re-testing by the present method using large test pieces as described in Annex B.