SRI LANKA STANDARD 1355 PART 2 : 2008
ISO 4674-2 : 1998

METHODS FOR DETERMINATION OF TEAR RESISTANCE OF RUBBER- OR PLASTICS - COATED FABRICS

PART 2 : BALLISTIC PENDULUM METHOD

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard

METHODS FOR DETERMINATION OF TEAR RESISTANCE OF RUBBER- OR PLASTICS - COATED FABRICS
PART 2 : BALLISTIC PENDULUM METHOD

SLS 1355 Part 2 : 2008
ISO 4674 - 2 : 1998
(Superseding SLS 761 Part 2 : 1986)

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SRI LANKA STANDARDS INSTITUTION
17, Victoria Place
Elvitigala Mawatha
Colombo - 08
Sri Lanka.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

Sri Lanka Standard
METHODS FOR DETERMINATION OF TEAR RESISTANCE OF RUBBER- OR PLASTICS - COATED FABRICS
PART 2 : BALLISTIC PENDULUM METHOD

NATIONAL FOREWORD

This standard was approved by the Sectoral Committee on Textiles, Clothing and Leather and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2008-12-19.

This Sri Lanka Standard is identical with ISO 4674 – 2 : 1998 Rubber – or plastics – coated fabrics - Determination of tear resistance. Part 2 : ballistic pendulum method.

This standard supercedes SLS 761 Part 2 : 1986 Methods of test for rubber or plastic coated fabrics. Part 2 Determination of tear resistance of rubber or plastic coated fabrics which was an adoption of ISO 4674 : 1977.

ISO 4674:1977 has been cancelled and replaced by ISO 4674-1:2003 and ISO 4674-2:1998.

TERMINOLOGY AND CONVERSIONS

The text of the International Standard has been accepted as suitable for publication, without deviation as a Sri Lanka Standard. However certain terminology and conversions are not identical with those used in Sri Lanka Standards, attention is therefore drawn to the following :

a) Wherever the words " International Standard/Publication" appear referring to this standard they should be interpreted as "Sri Lanka Standard".

b) The comma has been used throughout as a decimal marker. In Sri Lanka Standards it is the current practice to use the full point at the base as the decimal marker.

c) Wherever page numbers are quoted, they are ISO page numbers.

SLS 1355 Part 2 : 2008
ISO 4674-2 : 1998
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CROSS REFERENCES

International Standard	Corresponding Sri Lanka Standard
ISO 2231 : 1989 Rubber or Plastics-coated fabrics – standard atmospheres for conditioning & testing	SLS 761 – 5 Methods of for rubber or plastic coated fabrics. Part 5 : 2005, Standard atmospheres for conditioning and testing of rubber or plastic coated fabrics
ISO 2286-2 : 1998 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	SLS 1354 Part 2 : 2008 Methods of determination of roll characteristics for rubber or plastic coated fabrics. Part 2 : Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate

INTERNATIONAL STANDARD

ISO 4674-2

First edition
1998-05-01

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 mouton-pendule

Reference number
ISO 4674-2:1998(E)

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.

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.

International Standard ISO 4674-2 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products.*

Together with part 1 of ISO 4674, this first edition of ISO 4674-2 cancels and replaces the first edition of ISO 4674 (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*

Annex A forms an integral part of this part of ISO 4674.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

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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, 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 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.

Other methods, for example the "wounded burst test", are under consideration as possible further parts.

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INTERNATIONAL STANDARD © ISO ISO 4674-2:1998(E)

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

Part 2:
Ballistic pendulum method

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 this ISO 4674 describes a method for the determination of tear resistance based on the action of an active force applied to a notched test piece.

The test may 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 are not to be compared with those obtained by methods involving constant rate of tear.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4674. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4674 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 2286-2:1998, *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 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.

4 Apparatus

4.1 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.

The apparatus is made up of the following parts:

4.1.1 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, for example by securing it by means of threaded bolts on a rigid table.

4.1.2 Pendulum, that 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.

4.1.3 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.

4.1.4 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.

4.1.5 Knife, to begin the tear in the test piece by cutting a slit mid-way between the two jaws.

Instructions for adjusting and calibrating the apparatus are given in annex A.

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

5 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 Test pieces

6.1 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.

6.2 Number

For each series of tests, select ten test pieces: five in the longitudinal direction and five in the transverse direction.

7 Time-lapse between manufacture and testing

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

8 Conditioning

Condition the test pieces in one of the standard atmospheres defined in ISO 2231.

If tests are to be carried out on wet test pieces, immerse the test pieces completely for a minimum of 1 h at 23 °C ± 3 °C in an aqueous solution of a wetting agent of concentration not more than 1 % (*m/m*), then thoroughly rinse in water and test within 1 min of removal from the water.

9 Procedure

Before testing materials for the first time, pre-test in order to select the weight of the pendulum so that measurements made on the test pieces give results lying between 15 % and 85 % of the full-scale reading of the measurement scale used, adding extra weights as necessary. If a result between 15 % and 85 % of the full-scale reading cannot be achieved, state this in the test report.

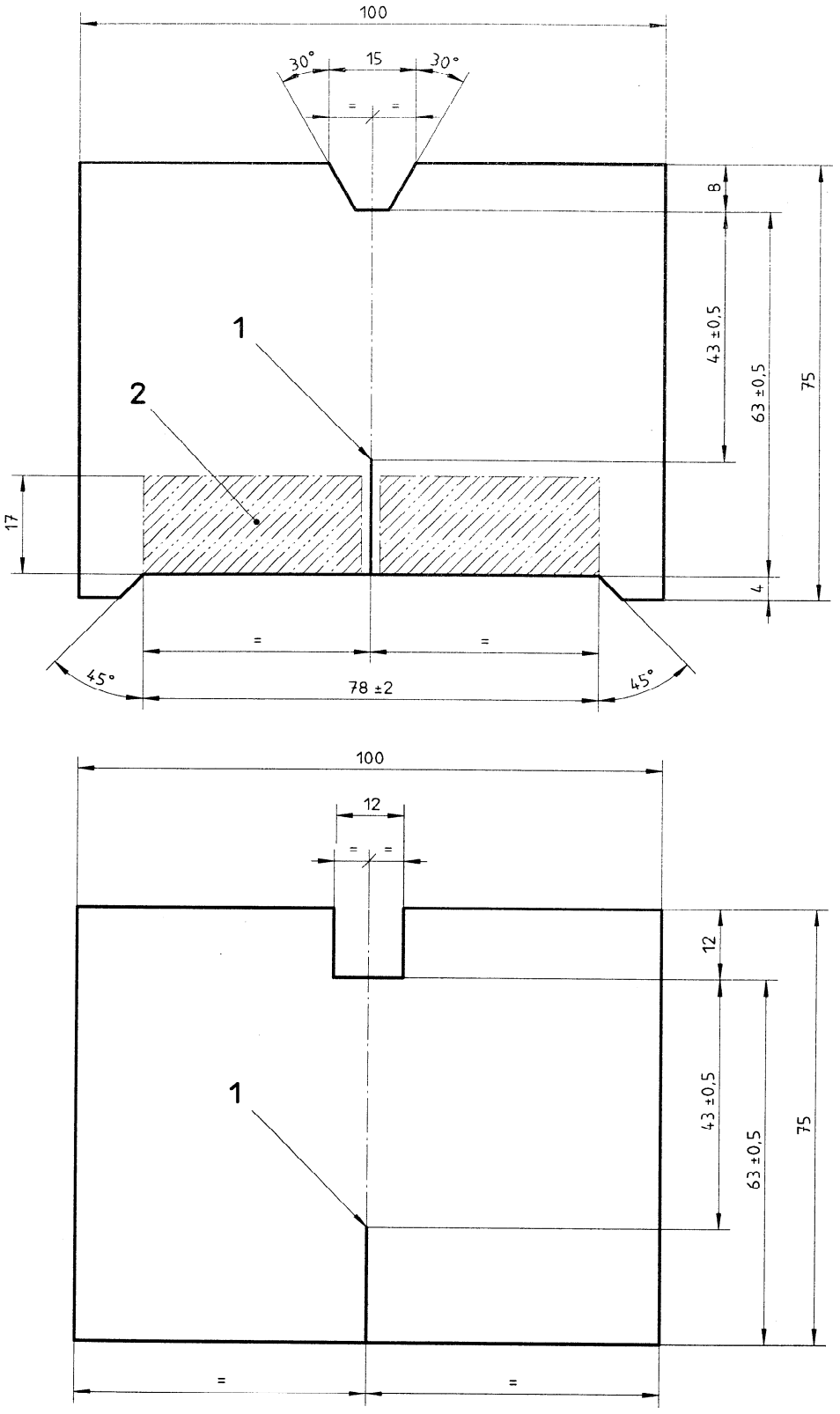
Check that the apparatus is set at zero as explained in annex A. Move the pendulum into the raised position.

Position the test piece in the jaws so that the long side of the test piece is parallel to the upper edge of the jaws. Clamp the test piece centred and with the bottom edge set against the bottom of the jaws.

Using the knife (4.1.5), cut a slit 20 mm ± 0,5 mm long in the side opposite the notch.

Release the pendulum. Restrain the pendulum on the return swing without disturbing the reading device.

Dimensions in millimetres



Key
1 Incision
2 Position of jaws

Figure 1 — Test piece designs

Read the energy or tearing force off the measurement device. Check that the result actually is within the zone between 15 % and 85 % of the full-scale reading of the scale used.

The test result is considered acceptable if
— no slippage occurs;
— the tear is completed;
— the tear remains within the 15 mm notched area.

Discard any other results. If three or more of the five results have to be excluded, then the test method is considered to be unsuitable.

NOTE — In this case, attempts may be made to evaluate the tear resistance by another method, for example using ISO 4674-1, but bearing in mind that there is no direct correlation between the methods.

10 Expression of results

The ballistic pendulum measures energy directly. In current practice, it is preferred to express tear resistance as a force, and equipment usually indicates it directly in newtons. Energy is converted into force using the following expression:

$$F = \frac{W}{L}$$

where

F is the tearing force, in newtons;
W is the tear energy, in joules;
L is the displacement of the point of application of the force, in metres.

Calculate the arithmetic mean of the five values obtained in each direction and round it to two significant figures.

11 Test report

The test report shall include the following particulars:

a) a reference to this part of ISO 4674;

b) all details necessary for identification of the sample;

c) the measurement scale used;

d) the conditioning or pre-treatment of the test pieces;

e) the individual results obtained for each of the ten test pieces;

f) the mean values in the longitudinal and transverse directions;

g) any irregularities concerning the direction of tear or incomplete tear, and any deviations from the procedure specified.

Annex A
(normative)

Adjustment and calibration

A.1 Adjusting the apparatus

A.1.1 General

If necessary, adjust the working parts of the apparatus to conform with the requirements of clause 4 and by following the manufacturer's instructions.

A.1.2 Levelling

It is essential that the apparatus is horizontal. Check it with a level and adjust it if necessary, using the levelling screws normally provided. Never modify the level of the apparatus to adjust the zero reading.

A.1.3 Cutting blade

With the pendulum hanging free, verify visually that the cutting blade is centred between the jaws and correct its position if necessary.

The height of the cutting blade shall be such that the length which will be torn in the notched test piece is 43 mm ± 0,5 mm. This can be checked easily by cutting a test piece from a sheet of coordinate paper graduated in millimetres, using the hollow punch or template (4.2). Adjust the height if necessary.

A blunt blade will adversely affect the results. If necessary, sharpen or replace the blade. In both cases, check the height again.

A.1.4 Friction in the bearing

Check for any friction in the bearings by operating the apparatus without a test piece and keeping the stop depressed so that the pendulum oscillates freely. The friction is considered negligible if at least 20 oscillations are completed before the amplitude falls to half the initial value.

A.1.5 Zero setting

After checking that the apparatus is level, operate it with no test piece in the jaws. Check that the measurement device actually indicates zero, to within a tolerance of ± 1 % of the full-scale reading. Adjust the measurement device, if necessary, in accordance with the manufacturer's instructions. The apparatus is considered to be properly adjusted when zero has been obtained three times consecutively.

A.2 Calibration

After adjustment of the apparatus, calibrate it using calibration masses obtainable from the manufacturer. Attach and use the calibration masses as specified by the manufacturer of the equipment for the type of tester being used. The reading shall be accurate to within ± 1 % of the calibration mass.

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ICS 59.080.40

Descriptors: fabrics, woven fabrics, coated fabrics, fabrics coated with rubber, fabrics coated with plastics, tests, mechanical tests, tear tests.

Price based on 6 pages

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SRI LANKA STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

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