
**Rubber, vulcanized or
thermoplastic — Determination of
tear strength —**

**Part 2:
Small (Delft) test pieces**

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*Caoutchouc vulcanisé ou thermoplastique — Détermination de la
résistance au déchirement —
Partie 2: Petites éprouvettes (éprouvettes de Delft)*

ISO 34-2:2015

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Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Principle	1
4 Apparatus	1
5 Calibration	2
6 Test pieces	2
6.1 Shape and dimensions	2
6.2 Measurement of dimensions	2
6.2.1 Measurement of thickness	2
6.2.2 Measurement of the total width outside the slit	4
6.3 Time interval between vulcanization and testing	6
6.4 Number	6
7 Temperature of test	6
8 Procedure	6
9 Expression of results	6
10 Precision	6
11 Test report	7
Annex A (informative) Precision results from an interlaboratory test programme	8
Annex B (normative) Calibration schedule	11
Bibliography	12

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://www.iso.org/foreword)

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This fourth edition cancels and replaces the third edition (ISO 34-2:2011), which has been technically revised. Precision results from an interlaboratory have been updated as [Annex A](#).

ISO 34 consists of the following parts, under the general title *Rubber, vulcanized or thermoplastic — Determination of tear strength*:

- *Part 1: Trouser, angle and crescent test pieces*
- *Part 2: Small (Delft) test pieces*

Rubber, vulcanized or thermoplastic — Determination of tear strength —

Part 2: Small (Delft) test pieces

WARNING 1 — Persons using this part of ISO 34 should be familiar with normal laboratory practice. This part of ISO 34 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.

WARNING 2 — Certain procedures specified in this part of ISO 34 might involve the use or generation of substances, or the generation of waste, that could constitute a local environmental hazard. Reference should be made to appropriate documentation on safe handling and disposal after use.

1 Scope

This part of ISO 34 specifies a method for the determination of the tear strength of small test pieces (Delft test pieces) of vulcanized or thermoplastic rubber.

NOTE The method does not necessarily give results agreeing with those given by the method described in ISO 34-1, which uses trouser, angle and crescent test pieces. It is used in preference to ISO 34-1 when the amount of material available is limited, and might be particularly suitable for testing small finished products.

<https://standards.iteh.ai/catalog/standards/sist/cfbc7e14-28e3-4695-92ec-6642639267e0/iso-34-2-2015>

2 Normative references

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

ISO 5893, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

ISO 18899:2013, *Rubber — Guide to the calibration of test equipment*

ISO 23529:2010, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Principle

The force required to tear across the width of a small test piece containing a slit in the centre is measured.

4 Apparatus

4.1 Tensile-testing machine, complying with the requirements of ISO 5893, capable of measuring force with an accuracy corresponding to class 1 as defined in ISO 5893, and with a rate of traverse of the moving grip of 500 mm/min \pm 50 mm/min.

4.2 Die, for cutting out the test piece. The construction of the die and the knife which cuts the slit are shown in [Figure 1](#) and [Figure 2](#).

4.3 Micrometer gauge, complying with the requirements of ISO 23529 and having a circular foot approximately 6 mm in diameter which exerts a pressure of $22 \text{ kPa} \pm 5 \text{ kPa}$.

4.4 Travelling microscope, giving at least $10\times$ magnification, fitted with a graticule graduated at 0,01 mm intervals.

5 Calibration

The requirements for calibration of the test apparatus are given in [Annex B](#).

6 Test pieces

6.1 Shape and dimensions

The test pieces shall be rectangular and shall conform to the dimensions shown in [Figure 3](#) and [Table 1](#).

The test pieces shall be cut from a sheet by punching with the die ([4.2](#)), using a single blow of a mallet or (preferably) a single stroke of a press. The rubber may be wetted with water or a soap solution, and shall be supported on a sheet of slightly yielding material (for example leather, rubber belting or cardboard) on a flat, rigid surface.

The tear strength is particularly susceptible to grain effects in the rubber. Normally, all test pieces are prepared with the grain at right angles to their length, but, in cases where grain effects are significant and are to be evaluated, two sets of test pieces shall be cut from the sheet, one at right angles to the grain and the other parallel to the grain.

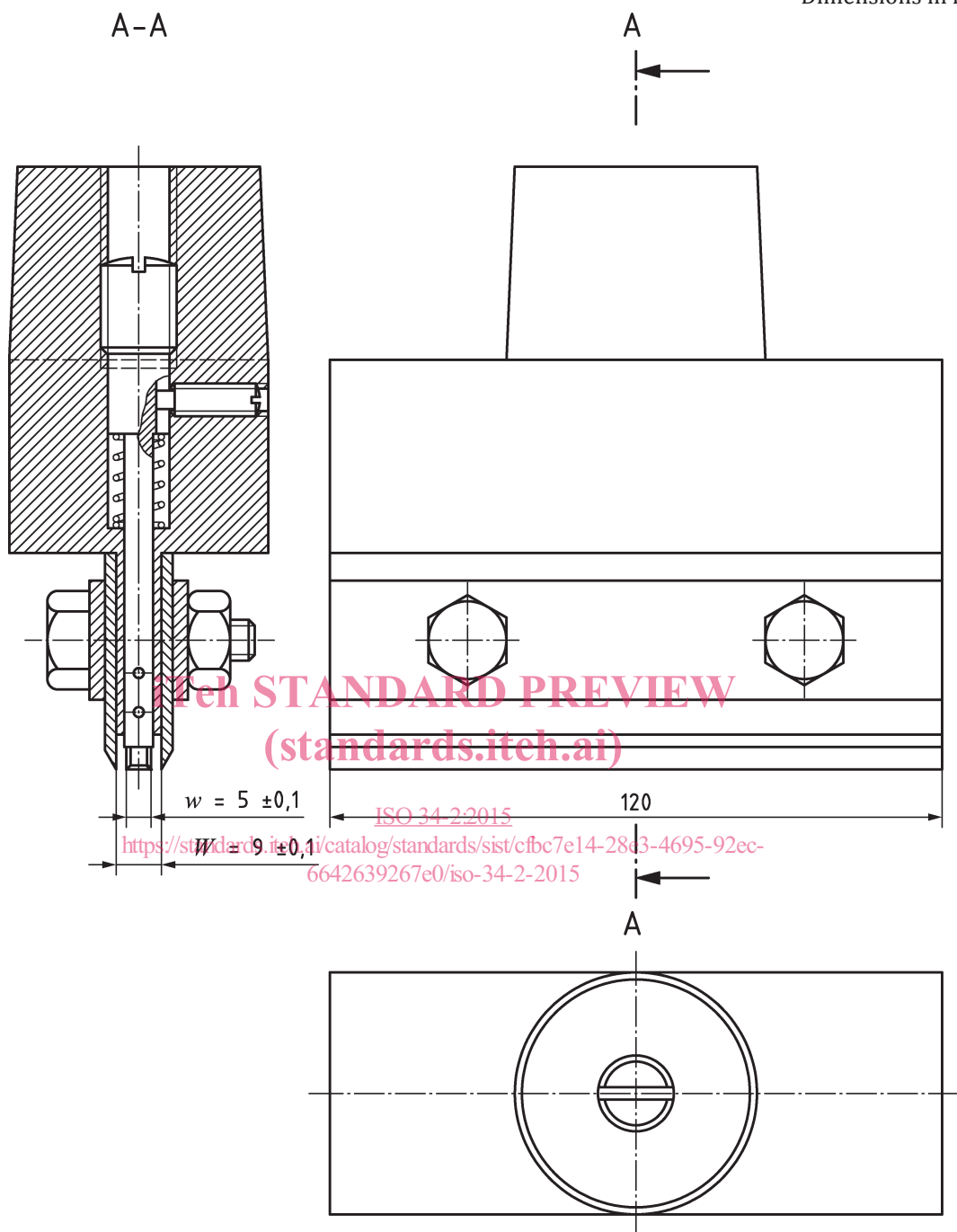
The thickness d of the test pieces shall be $2,0 \text{ mm} \pm 0,2 \text{ mm}$.

6.2 Measurement of dimensions

6.2.1 Measurement of thickness

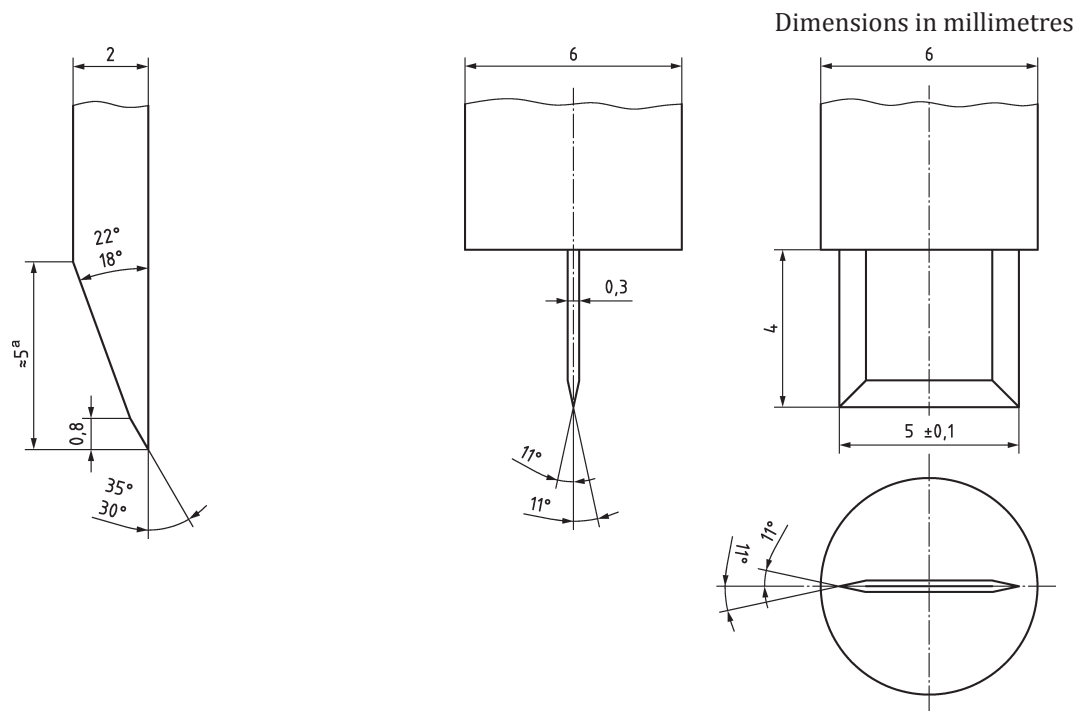
Measure the thickness of the test piece by ISO 23529:2010, method A. Take at least three gauge readings in the region of the slit. If an even number of readings is taken, use the average of the two median values as the result. If an odd number of readings is taken, use the median value. No reading shall deviate by more than 2 % from the value used. When the test results are to be used for comparative purposes, the thickness of any test piece shall not vary by more than 10 % from the mean thickness of all the test pieces.

Dimensions in millimetres



NOTE $b_3 = W - w$ (method 2)

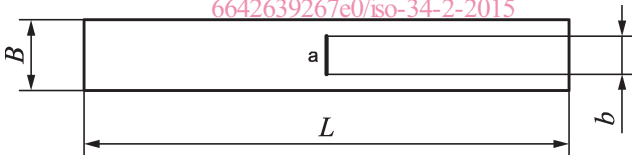
Figure 1 — Die for Delft test pieces



a) Enlarged detail of blade for cutting out test piece b) Enlarged detail of small blade for cutting slit

NOTE Cutting edge.

Figure 2 — Details of Delft test piece die cutting edges



Key
a Slit to be symmetrical with the width.

Figure 3 — Test piece

Table 1 — Dimensions of test piece

Dimension		Value mm
L	Length	60
B	Width	9,0 ± 0,1
b	Slit length	5,0 ± 0,1

6.2.2 Measurement of the total width outside the slit

6.2.2.1 General

The total width outside the slit b_3 corresponds to the rubber to be torn.

Two methods of measurement may be used. Method 1 is theoretically more exact, but is difficult to use in practice. Method 2, which is in common use, is simpler but can give different results. Unless otherwise specified, use method 2.

Results obtained using test pieces measured by different methods shall not be compared.

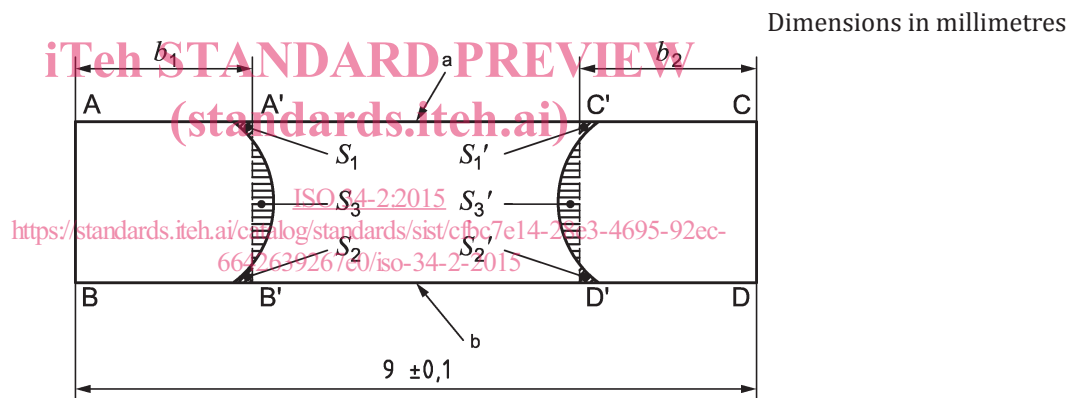
6.2.2.2 Method 1: Measurement by travelling microscope

Variations occur in the length of the slit and in the total width of the test piece when the same die is used to prepare test pieces from rubber of different hardnesses. Moreover, the slit might not be uniform throughout its depth, but might be wider at one surface. Take one test piece which has been cut out with the die, therefore, and use it to measure the width to be torn by cutting the test piece through with a sharp razor blade in the plane of the slit and measuring the cut surfaces (width on either side of the slit) with a travelling microscope. The ends of the slit are curved as shown in Figure 4, and an attempt shall be made to allow for this curvature when measuring the width on either side of the slit, as follows.

Take as the width on the left-hand side b_1 , which is the distance from the line AB to an imaginary line A'B' which is situated so that the total area $S_1 + S_2 = S_3$.

Similarly, on the right-hand side, imagine a line C'D' situated so that the total area $S_1' + S_2' = S_3'$ and b_2 is the width.

The total width b_3 outside the slit (i.e. the rubber to be torn) is then $b_1 + b_2$.



Key

- a Top
- b Bottom

NOTE $b_3 = b_1 + b_2$ (method 1).

Figure 4 — Section through slit in Delft test piece

6.2.2.3 Method 2 (simpler): Measurement from the dimensions of the die used to cut the test piece

Calculate b_3 from the dimensions of the die (see Figure 1), using Formula (1):

$$b_3 = W - w \quad (1)$$

where

W is the measured distance between the cutting edges of the die;

w is the measured width of the blade for cutting the slit.