

Physical testing of rubber —

Part A2: Method for determination of tensile stress-strain properties

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/22, upon which the following bodies were represented:

- British Railways Board
- British Rubber Manufacturers' Association Ltd.
- GAMBICA (BEAMA Ltd.)
- Malaysian Rubber Producers' Research Association
- Ministry of Defence
- RAPRA Technology Ltd.
- SATRA Footwear Technology Centre
- Coopted member

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National foreword

This Part of BS 903 has been prepared by Technical Committee PRI/22. It is identical with ISO 37:1994 *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties* published by the International Organization for Standardization (ISO). This edition supersedes BS 903-A2:1989 which is withdrawn

This edition of Part A2 differs from the 1989 edition as follows:

- a) Types 3 and 4 dumb-bells are now Types 4 and 3 respectively (6.1 and Table 2.)
- b) The calculation of tensile strength at break has been added for ring test pieces (15.2.2).

Cross-references

International standard	Corresponding British Standard
	BS 903 Physical testing of rubber
ISO 471:1983	Part A35:1985 <i>Temperatures, humidities and times for conditioning and testing of pieces</i> (Technically equivalent)
ISO 3383:1985	Part A32:1988 <i>General directions for achieving elevated or subnormal temperatures for test purposes</i> (Identical)
ISO 4648:1981	Part A38:1991 <i>Methods for the determination of dimensions of test pieces and products for test purposes</i> (Identical)
ISO 4661-1:1993	Part A36:1988 <i>Preparation of samples and test pieces</i> (Identical)
ISO 5893:1993	BS 5214 <i>Test machines for rubber and plastics</i> Part 1:1975 <i>Tensile, flexural and compression machines</i> (Technically equivalent)

The Technical Committee has reviewed the provisions of ISO 1826:1981 to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard related to ISO 1826:1981 is BS 903 *Physical testing of rubber* Part A19:1986 *Heat resistance and accelerated ageing*.

Additional information

In the UK the standard temperature (see 10.3 and clause 14) is 23 °C ± 2 °C.

NOTE The “standard temperature” is commonly referred to as the “standard laboratory temperature”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard describes a method for the determination of the tensile stress-strain properties of vulcanized and thermoplastic rubbers. The properties which may be determined are the tensile strength, the elongation at break, the stress at a given strain and the elongation at a given stress. Means of specifying or determining the yield point are also given.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this International Standard 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 471:—¹⁾, *Rubber — Times, temperatures and humidities for conditioning and testing*.

ISO 1826:1981, *Rubber, vulcanized — Time-interval between vulcanization and testing — Specification*.

ISO 3383:1985, *Rubber — General directions for achieving elevated or subnormal temperatures for test purposes*.

ISO 4648:1991, *Rubber, vulcanized or thermoplastic — Determination of dimensions of test pieces and products for test purposes*.

ISO 4661-1:1993, *Rubber, vulcanized or thermoplastic — Preparation of samples and test pieces — Part 1: Physical tests*.

ISO 5893:1993, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Description*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1

tensile stress, S

a stress applied so as to extend the test piece. It is calculated as the applied force per unit area of the original cross-section of the test length

3.2

elongation, E

the extension, expressed as a percentage of the test length, produced in the test piece by a tensile stress

3.3

tensile strength, TS

the maximum tensile stress recorded in extending the test piece to breaking point [See Figure 1 a) to Figure 1 c).]

3.4

tensile, strength at break, TS_b

the tensile stress recorded at the moment of rupture [See Figure 1 a) to Figure 1 c).]

NOTE 1 The values of TS and TS_b may be different if, after yield S_y , the elongation continues and is accompanied by a drop in stress, resulting in TS_b being lower than TS . [See Figure 1 c).]

3.5

elongation at break, E_b

the tensile strain in the test length at breaking point [See Figure 1 a) to Figure 1 c).]

3.6

elongation at a given stress, E_s

the tensile strain in the test length when the test piece is subjected to a given tensile stress

3.7

stress at a given elongation, S_e

the tensile stress in the test length required to produce a given elongation

NOTE 2 In the rubber industry, this definition is widely identified with the term “modulus”, and care should be taken to avoid confusion with the other use of “modulus” to denote the slope of the stress-strain curve at a given elongation.

3.8

tensile stress at yield, S_y

the tensile stress at the first point on the stress-strain curve where some further increase in strain occurs without any increase in stress. This may correspond to either a point of inflection [see Figure 1 b)] or to a maximum [see Figure 1 c)]

3.9

elongation at yield, E_y

the tensile strain at the first point on the stress-strain curve where some further increase in strain is not accompanied by an increase in stress [See Figure 1 b) and Figure 1 c).]

3.10

test length of a dumb-bell

the initial distance between reference points within the length of the narrow portion of a dumb-bell test piece and used to measure elongation (See Figure 2.)

¹⁾ To be published (Revision of ISO 471:1983).

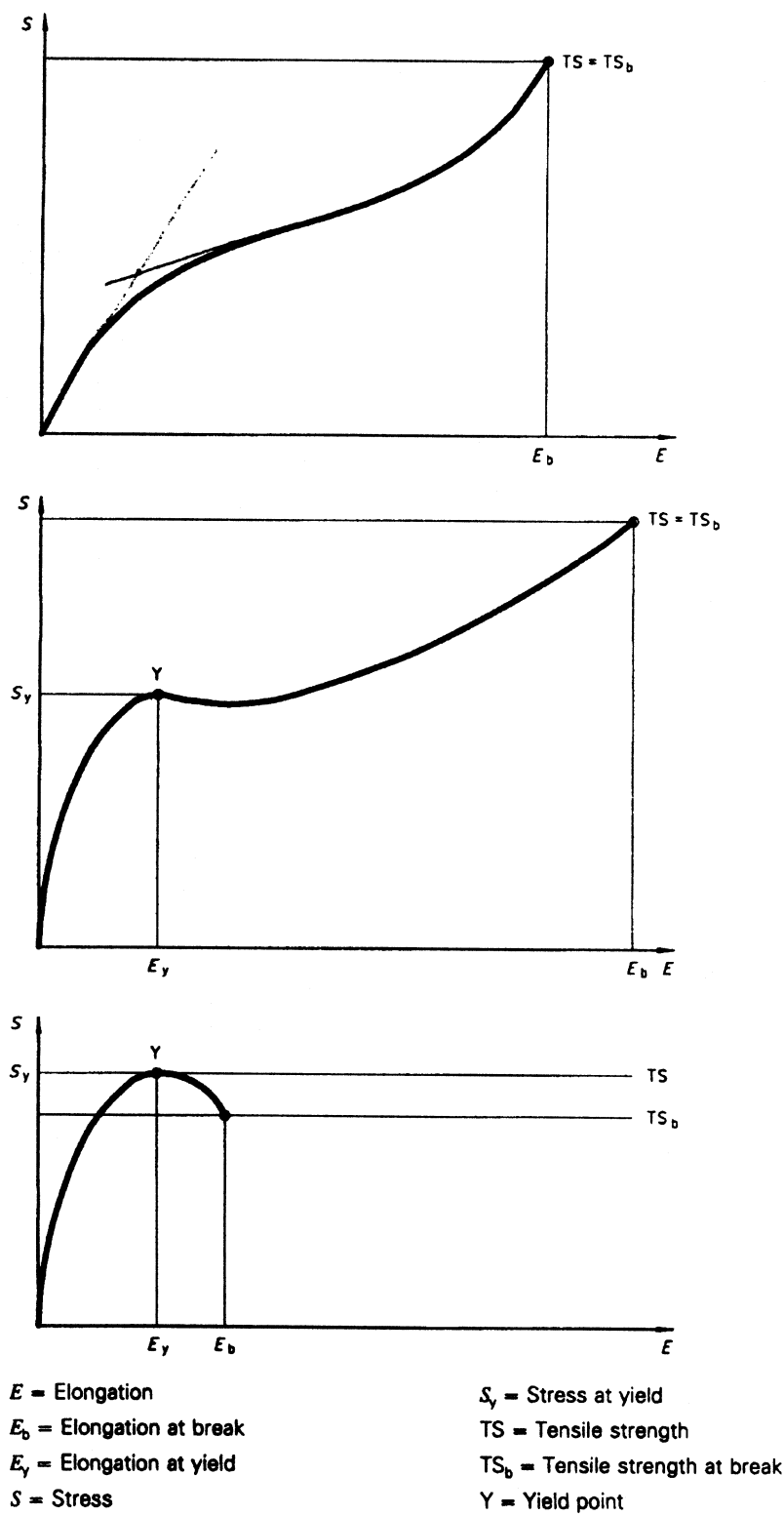


Figure 1 — Illustration of tensile terms