

BS 903-0:2012



BSI Standards Publication

Physical testing of rubber

Part 0: General

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Summary of pages

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 August 2012. It was prepared by Technical Committee PRI/22 *Physical Testing of Rubber*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 903-0:2003, which is withdrawn.

Information about this document

BS 903 is the best-known British Standard for rubber and was first published as a compilation of test methods in 1940. It quickly developed an international reputation, especially in the Commonwealth and parts of Europe, and many of its methods were subsequently adopted as international (ISO) standards. Some individual parts of BS 903 remain but most test methods for rubber are now BS ISO standards which are no longer part of an easily recognizable series. This Part of BS 903 has been prepared to bring these test methods together. The work of Subcommittee ISO/TC 45/SC2, *Rubber and rubber products – Testing and analyses*, continues in reviewing and revising international standards and in developing new test methods and guides to keep abreast of changes and developments in technology, and in this the UK plays a leading and active role. As a consequence, the status of methods is continually changing, as new editions are published and new methods appear. It is therefore never possible for this Part of BS 903 to be completely up-to-date and this edition only provides a snapshot in time.

The methods in BS 903 were originally divided into four series of parts:

- the 'A' series for physical testing of rubber;
- the 'B' series for chemical tests for raw and vulcanized rubber;
- the 'C' series for determination of electrical properties; and
- the 'D' series for testing of ebonite.

The current methods for physical testing, including determination of electrical properties, are listed in this standard. The BS 903 'B' series has been replaced by BS 7164. The BS 903 'D' series has been withdrawn but certain test methods for plastics are applicable to ebonite (see BS 2782-0).

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 903 provides a general introduction to BS 903 and to BS ISO standards. It describes a range of laboratory-scale methods for the physical testing of rubber in raw, unvulcanized, vulcanized and thermoplastic forms. A list of closely-related British Standards is also provided.

NOTE The status of methods referenced need to be verified with the relevant standards body; they are continually changing as new editions are issued and new methods appear, in line with developments in technology.

2 Terms and definitions

For the purposes of this part of BS 903, the terms and definitions given in BS ISO 1382 apply.

3 Normative reference

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.

BS ISO 1382, *Glossary of rubber terms*

4 Reproducibility

A number of the test methods include a statement on test precision as determined by an interlaboratory test programme and ISO/TC 45 intends for this to be extended to all methods.

NOTE Attention is drawn to ISO/TR 9272 and ISO/TR 11753.

5 Test method categories and properties

5.1 General

The individual test methods published in BS 903 and as BS ISO standards are listed in Annex A. The methods fall into eight main categories:

- 1) tests for raw and unvulcanized rubber;
- 2) preparative procedures;
- 3) mechanical tests;
- 4) viscoelastic tests;
- 5) degradation and environmental tests;
- 6) tests on effect of fluids
- 7) adhesion and contact property tests; and
- 8) electrical tests.

NOTE The prefix "BS 903" applies to the referenced standards unless otherwise indicated.

In terms of these categories, the standards may be grouped as in Table 1 to Table 8, although there is some overlap.

5.2 Raw and unvulcanized rubber

See Table 1 for tests for raw and unvulcanized rubber.

Table 1 Raw and unvulcanized rubber

Type of test	Standard
Mooney viscometer tests	
Mooney viscosity	BS ISO 289-1
Delta Mooney (for non-pigmented, oil-extended, emulsion-polymerized SBR)	A58-1: (≡ ISO 289-3)
Mooney stress relaxation rate	BS ISO 289-4
Plastimeter tests	
Rapid plasticity number	BS ISO 2007
Plasticity retention index	BS ISO 2930
Curemeter tests	
Curemeters – Guide to the use of curemeters	A60-1 (≡ BS ISO 6502)
Vulcanization characteristics using oscillating disc curemeter	BS ISO 3417
Other tests	
Green strength of raw or unvulcanized rubber	BS ISO 9026
Assessment of carbon black dispersion	BS ISO 11345

NOTE BS ISO 11345 is also applicable to vulcanized rubber.

5.3 Preparative procedures

See Table 2 for preparative procedures.

Table 2 Preparative procedures

Type of test	Standard
Preparation, mixing and vulcanization of test samples	BS ISO 2393
Preparation of samples and test pieces	BS ISO 23529
Measurement of dimensions of test pieces	BS ISO 23529

NOTE 1 For raw rubber, attention is also drawn to BS ISO 1795.

NOTE 2 See BS ISO 23529 for guidance on the selection of standard test temperatures and humidities for conditioning and testing, and for directions for achieving elevated or subnormal temperatures.

5.4 Mechanical

See Table 3 for mechanical tests.

Table 3 Mechanical tests

Type of test	Standard
Density	BS ISO 2781
Stress-strain properties	
in tension	BS ISO 37
in compression	BS ISO 7743
in shear	BS ISO 1827
dynamic	BS ISO 4664
stress in tension on heating	BS ISO 12493

Table 3 Mechanical tests (continued)

Type of test	Standard
Hardness	
Introduction and guide	BS ISO 18517
IRHD	BS ISO 48
<i>by pocket hardness meters</i>	
IRHD	BS ISO 7619-2
Shore durometer	BS ISO 7619-1
Very low hardness scale (VLRH)	BS ISO 27588
Calibration and verification of hardness meters	BS ISO 18898
<i>NOTE Test methods for the apparent hardness of rubber covered rollers are described in BS ISO 7267 (all parts).</i>	
Strength properties	
Tensile	BS ISO 37
Tear	
Trouser, Angle and Crescent tear	BS ISO 34-1
Delft tear	BS ISO 34-2
de Mattia, flex cracking, crack growth	BS ISO 132
Tension fatigue	BS ISO 6943
Crack growth rate	BS ISO 27727

5.5 Viscoelasticity

See Table 4 for viscoelasticity tests.

Table 4 Viscoelasticity tests

Type of test	Standard
Set, recovery and relaxation	
Compression set	BS ISO 815-1 and BS ISO 815-2
Tension set	BS ISO 2285
Creep	BS ISO 8013
Stress relaxation	BS ISO 3384-1
Dynamic testing	
General guidance	BS ISO 4664-1
Torsion pendulum	BS ISO 4664-2
Resilience	BS ISO 4662
Heat build-up	
Basic principles	BS ISO 4666-1
Compression flexometer	BS ISO 4666-3
Constant stress flexometer	BS ISO 4666-4
<i>NOTE BS ISO 4666 may also be used to determine resistance to fatigue, creep and set caused by thermal degradation during flexure.</i>	

5.6 Degradation and environmental

See Table 5 for degradation and environmental tests.

Table 5 Degradation and environmental tests

Type of test	Standard
Thermal and thermal-oxidative ageing	
Accelerated ageing and heat resistance	BS ISO 188
By stress relaxation	BS ISO 6914
<i>NOTE BS ISO 815-1, BS ISO 2285, BS ISO 8013, BS ISO 3384 and BS ISO 4665 may also be used to measure the time-dependent thermal stability of vulcanized rubber under specified conditions.</i>	
Ozone and weathering resistance	
Static strain ozone exposure	BS ISO 1431-1
Dynamic strain ozone exposure	BS ISO 1431-1
Ozone concentration	BS ISO 1431-3
Outdoor exposure	BS ISO 4665
Artificial light exposure	BS ISO 4665
Assessment of properties after weathering	BS ISO 4665
Low temperature properties	
Torsion modulus (Gehman test)	A13 (≡ ISO 1432)
Impact brittleness	BS ISO 812
Temperature retraction	BS ISO 2921
Compression set	BS ISO 815-2
Crystallization by hardness measurements	BS ISO 3387

5.7 Effects of fluids

See Table 6 for tests on the effects of fluids.

Table 6 Effects of fluids

Resistance to liquids	BS ISO 1817
Water vapour absorption	A18 (no corresponding ISO)
Gas permeability	BS ISO 2782
Vapour transmission rate of volatile liquids (for rubber sheets and coated fabrics)	BS EN ISO 6179
<i>NOTE Attention is also drawn to BS ISO 13226.</i>	

5.8 Adhesion and contact properties

See Table 7 for test for adhesion and contact properties.

Table 7 Adhesion and contact properties

Type of test	Standard
Adhesion strength to fabrics	
Peel test	BS ISO 36
Direct tension	A27 (≡ ISO 4637)
Adhesion strength to textile cord	BS ISO 4647
Adhesion strength to wire cord	BS ISO 5603
Adhesion strength to rigid materials	
peel test	BS ISO 813
two-plate method	BS ISO 814
in quadruple shear	BS ISO 1827
using conical test pieces	BS ISO 5600
<i>NOTE Includes metals and plastics materials. BS ISO 813 and BS ISO 814 are intended primarily for rubber to metal adhesion, but may be applied to other rigid substrates.</i>	
Contact properties	
Straining of organic materials	BS ISO 3865
Adhesion to and corrosion of metals	BS ISO 6505
Friction	BS ISO 15113
Abrasion tests	
Guidance	BS ISO 23794
by Akron ^{A)} and DuPont ^{B)} methods	BS 903 A9 (partially replaced by BS ISO 4649)
by rotating cylindrical drum device	BS ISO 4649
^{A)} Akron is a trade mark owned by Corporate Consulting, Service & Instruments, Incorporated University Park, 221 Beaver Street, Akron, Ohio 44304, USA and is the trade name of a product. This information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of the product named. Equivalent products may be used if they can be shown to lead to the same results.	
^{B)} DuPont is a trade mark owned by E. I. du Pont de Nemours and Company, 1007 North Market Street Wilmington, DE 19898, United States and is the trade name of a product. This information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of the product named. Equivalent products may be used if they can be shown to lead to the same results.	

5.9 Electrical properties

See Table 8 for tests for electrical properties

Table 8 Electrical properties

Type of test	Standard
Determination of surface resistivity	BS ISO 14309 (replaces BS 903 C1)
Determination of volume resistivity	BS ISO 14309 (replaces BS 903 C2)
Determination of permittivity	BS 7663 (replaces BS 903 C3)
Determination of electrical strength	BS EN 60243-2 (replaces BS 903 C4)
Conductive and dissipative rubber	
Determination of resistivity	BS ISO 1853
Determination of electrical resistance	BS ISO 2878

6 Usage

6.1 Application

For the testing of rubber, the use of BS 903 and BS ISO test methods should always be considered before resorting to other methods or procedures. These methods are intended for use with small, laboratory test pieces taken either from specially prepared samples or test sheets or from finished rubber products. In most instances, these test pieces are cut by dies or knives from a representative sample. In these cases attention is drawn to the procedures specified in BS ISO 23529 as the method of preparation can affect test performance, especially where strength measurements are involved. For some tests, directly moulded test pieces are necessary or most appropriate.

The test methods are applicable to unvulcanized and vulcanized rubber prepared from dry rubber or latex. Most, although not all, of the test methods described for vulcanized rubber are suitable for use with thermoplastic rubbers and their products. The scopes of many of the test methods have already been extended to include thermoplastic rubbers.

The test methods are not intended for use with cellular rubber or with rubber-coated fabrics except where specified, although several standards may be applied to some cellular rubber materials and products. Dedicated test methods for flexible cellular materials are given in BS 4443 and in several BS ISO and BS EN standards, whilst dedicated methods for coated fabrics are given in BS 3424 (all parts) and several BS ISO and BS EN standards.

6.2 Selection of test method

Detailed guidance on the selection and use of laboratory-scale tests is given in BS 903-1.

Many of the methods give options for test piece size and shape, test procedure, test environment and, where appropriate, test duration. For example, heat ageing tests conducted in accordance with BS ISO 188 may be carried out at one or more of several standard or recommended test temperatures and times. Such options should be selected to suit the particular application, and in all cases the conditions used should be specified and reported. The size of sample or product, the overall test time, the anticipated service environment and, for example, whether or not the test is for quality control or type approval purposes should be considered.

Attention is drawn to BS ISO 24453 and BS ISO 24454 on the acquisition and presentation of comparable test data. These standards specify test procedures, test pieces and conditions from the options given in test methods in order to assist a meaningful comparison of materials and reduce unnecessary testing. BS ISO 24453 addresses single-point data, whilst BS ISO 24454 is concerned with multi-point data, for example the results of accelerated ageing for several test times.

A guide to the application of rubber testing to finite element analysis is given in BS 903-5.

The following are also useful when selecting test methods and choosing test conditions:

- a) BS 6716;
- b) *Physical Testing of Rubber* [1]; and
- c) *Handbook of Polymer Testing: Physical Methods* [2].

6.3 Expression of test results

At present, not all of the test methods specify the number of significant figures to which the test results should be expressed. For comparative purposes it is desirable that the precision should be the same irrespective of the means by which the individual results of the appropriate measure of central tendency is calculated. Thus results need to be rounded off to an accuracy representative of the test method and the number of test pieces specified.

6.4 Calibration of test equipment

It is important that the test equipment specified in test methods is suitably calibrated for consistent and reproducible test results. Attention is therefore drawn to the specification, procedures and schedules for the calibration of rubber and plastic test equipment described in BS 7825. The calibration of hardness meters is specified in BS ISO 18898. Specifications for testing machines for rubber and plastics are given in BS ISO 5893.

Calibration schedules for individual tests are being included in the revision of various standards.

7 Statistical analysis

Attention is drawn to BS ISO 19003, which provides examples of statistical techniques, applied to particular rubber testing situations. Attention is also drawn to PD ISO/TR 12134 for the estimation of uncertainty for rubber test methods.

8 Analysis of graphical traces

Graphical traces of test results are sometimes interpreted automatically by software packages that might not use the same basis of analysis, which can lead to differences in interpretation and in test results. BS ISO 6133 provides a means of avoiding this.

Annex A
(informative)

List of British Standard test methods for the physical properties of rubber

Table A.1 shows test methods for rubber and the BS 903 C series of electrical tests for rubber.

Table A.1 British Standard test methods for the physical properties of rubber

Standard number	Title
Associated methods	
BS 903-1:1995	Physical testing of rubber – Part 1: Guide to the selection and use of methods of test for rubber
BS 903-5:2004	Physical testing of rubber – Part 5: Guide to the application of rubber testing to finite element analysis
BS ISO 19003:2006	Rubber and rubber products – Guidance on the application of statistics to physical testing
BS ISO 24453:2008	Rubber – Acquisition and presentation of comparable single-point data
BS ISO 24454:2008	Physical testing of rubber – Acquisition and presentation of comparable multi-point data
Methods of testing rubber	
BS ISO 34-1:2010	Rubber, vulcanized or thermoplastic – Determination of tear strength – Part 1: Trouser, angle and crescent test pieces
BS ISO 34-2:2010	Rubber, vulcanized or thermoplastic – Determination of tear strength – Part 2: Small (Delft) test pieces
BS ISO 36:2011	Rubber, vulcanized or thermoplastic – Determination of adhesion to textile fabrics
BS ISO 37:2011	Rubber, vulcanized or thermoplastic – Determination of tensile stress-strain properties
BS ISO 48:2010	Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)
BS ISO 132:2011	Rubber, vulcanized or thermoplastic – Determination of flex cracking and crack growth (De Mattia)
BS ISO 188:2011	Rubber, vulcanized or thermoplastic – Accelerated ageing and heat resistance tests
BS ISO 289-1	Rubber, unvulcanized – Determinations using a shearing-disc viscometer – Part 1: Determination of Mooney viscosity
BS ISO 289-4	Rubber, unvulcanized – Determinations using a shearing-disc viscometer – Part 4: Determination of the Mooney stress-relaxation rate
BS ISO 812:2011	Rubber, vulcanized or thermoplastic – Determination of low-temperature brittleness
BS ISO 813:2010	Rubber, vulcanized or thermoplastic – Determination of adhesion to a rigid substrate – 90°C peel method
BS ISO 814:2011	Rubber, vulcanized or thermoplastic – Determination of adhesion to metal – Two-plate method
BS ISO 815-1:2008	Rubber, vulcanized or thermoplastic – Determination of compression set – Part 1: At ambient or elevated temperatures
BS ISO 815-2:2008	Rubber, vulcanized or thermoplastic – Determination of compression set – Part 2: At low temperatures
BS 903-A9:1988	Physical testing of rubber – Determination of abrasion resistance

Table A.1 British Standard test methods for the physical properties of rubber (continued)

Standard number	Title
BS ISO 1431-1:2004+A1:2009	Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Part 1: Static and dynamic strain testing
BS ISO 1431-3:2000, BS 903-A45:2000	Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Part 3: Reference and alternative methods for determining the ozone concentration in laboratory test chambers
BS 903-A13:1990, ISO 1432:1988	Physical testing of rubber – Method for determination of stiffness at low temperature (Gehman test)
BS 903-A18:1973	Physical testing of rubber – Determination of equilibrium water vapour absorption
BS 903-A27:1986, ISO 4637:1979	Physical testing of rubber – Determination of rubber to fabric adhesion – Direct tension method
BS 903-A58-1:2001, ISO 289-3:1999	Physical testing of rubber – Methods using the Mooney viscometer – Determination of the Delta Mooney value for non-pigmented, oil-extended, emulsion-polymerized SBR – Part 1: Determination of the Delta Mooney value for non-pigmented, oil-extended, emulsion-polymerized SBR
BS 903-A60-1:2000, BS ISO 6502:1999	Physical testing of rubber – Curemetering – Part 1: Guide to the use of curemeters
BS 903-A63:1995, ISO 3387:1994	Physical testing of rubber – Method for determination of crystallization effects by hardness measurements
BS ISO 1817:2011	Rubber, vulcanized or thermoplastic – Determination of the effect of liquids
BS ISO 1827:2011	Rubber, vulcanized or thermoplastic – Determination of shear modulus and adhesion to rigid plates – Quadruple-shear methods
BS ISO 2007:2007	Rubber, unvulcanized – Determination of plasticity – Rapid-plastimeter method
BS ISO 2285:2007	Rubber, vulcanized or thermoplastic – Determination of tension set under constant elongation, and of tension set, elongation and creep under constant tensile load
BS ISO 2393:2008	Rubber test mixes – Preparation, mixing and vulcanization – Equipment and procedures
BS ISO 2781:2008+A1:2010	Rubber, vulcanized or thermoplastic – Determination of density
BS ISO 2782:2006	Rubber, vulcanized or thermoplastic – Determination of permeability to gases
BS ISO 2921:2011	Rubber, vulcanized – Determination of low-temperature retraction (TR test)
BS ISO 2930:2009	Rubber, raw natural – Determination of plasticity retention index (PRI)
BS ISO 3417:2008	Rubber – Measurement of vulcanization characteristics with the oscillating disc curemeter
BS ISO 3865:2005	Rubber, vulcanized or thermoplastic – Methods of test for staining in contact with organic material
BS ISO 3387	Rubber – Determination of crystallization effects by hardness measurement
BS ISO 3384-1:2011	Rubber, vulcanized or thermoplastic – Determination of stress relaxation in compression – Part 1: Testing at constant temperature
BS ISO 4647:2010	Rubber, vulcanized – Determination of static adhesion to textile cord – H-pull test
BS ISO 4649:2010	Rubber, vulcanized or thermoplastic – Determination of abrasion resistance using a rotating cylindrical drum device
BS ISO 4662:2009	Rubber, vulcanized or thermoplastic – Determination of rebound resilience
BS ISO 4664-1:2011	Rubber, vulcanized or thermoplastic – Determination of dynamic properties – Part 1: General guidance

Table A.1 British Standard test methods for the physical properties of rubber (continued)

Standard number	Title
BS ISO 4664-2:2006	Rubber, vulcanized or thermoplastic – Determination of dynamic properties – Part 2:Torsion pendulum methods at low frequencies
BS ISO 4665:2006	Rubber, vulcanized or thermoplastic – Resistance to weathering
BS ISO 4666-1:2010	Rubber, vulcanized – Determination of temperature rise and resistance to fatigue in flexometer testing – Part 1:Basic principle
BS ISO 4666-3:2010	Rubber, vulcanized – Determination of temperature rise and resistance to fatigue in flexometer testing – Part 3: Compression flexometer (constant-strain type)
BS ISO 4666-4:2007	Rubber, vulcanized – Determination of temperature rise and resistance to fatigue in flexometer testing – Part 4: Constant-stress flexometer
BS ISO 5600:2011	Rubber – Determination of adhesion to rigid materials using conical shaped parts
BS ISO 5603:2011	Rubber, vulcanized – Determination of adhesion to wire cord
BS ISO 6133:1998	Rubber and plastics – Analysis of multi-peak traces obtained in determinations of tear strength and adhesion strength
BS EN ISO 6179:2010	Rubber, vulcanized or thermoplastic – Rubber sheets and rubber-coated fabrics – Determination of transmission rate of volatile liquids (gravimetric technique)
BS ISO 6505:2005	Rubber, vulcanized or thermoplastic – Determination of tendency to adhere to and corrode metals
BS ISO 6914:2008	Rubber, vulcanized or thermoplastic – Determination of ageing characteristics by measurement of stress relaxation in tension
BS ISO 6943:2011	Rubber, vulcanized – Determination of tension fatigue
BS ISO 7619-1:2010	Rubber, vulcanized or thermoplastic – Determination of indentation hardness – Part 1:Durometer method (Shore hardness)
BS ISO 7619-2:2010	Rubber, vulcanized or thermoplastic – Determination of indentation hardness – IRHD pocket meter method
BS ISO 7743:2011	Rubber, vulcanized or thermoplastic – Determination of compression stress-strain properties
BS ISO 8013:2006	Rubber, vulcanized – Determination of creep in compression or shear
BS ISO 9026:2007	Raw rubber or unvulcanized compounds – Determination of green strength
BS ISO 13226:2011	Rubber – Standard reference elastomers (SREs) for characterizing the effect of liquids on vulcanized rubbers
BS ISO 11345:2006	Rubber – Assessment of carbon black and carbon black/silica dispersion – Rapid comparative methods
BS ISO 12493:2011	Rubber, vulcanized – Determination of stress in tension upon heating
BS ISO 15113:2005	Rubber – Determination of frictional properties
BS ISO 18517:2005	Rubber, vulcanized or thermoplastic – Hardness testing – Introduction and guide
BS ISO 23794:2010	Rubber, vulcanized or thermoplastic – Abrasion testing – Guidance
BS ISO 27588:2008	Rubber, vulcanized or thermoplastic – Determination of dead-load hardness using the very low rubber hardness (VLRH) scale
BS ISO 18898:2006	Rubber – Calibration and verification of hardness testers
BS ISO 23529:2010	Rubber – General procedures for preparing and conditioning test pieces for physical test methods
BS ISO 27727:2008	Rubber, vulcanized – Measurement of fatigue crack growth rate

Table A.1 British Standard test methods for the physical properties of rubber (*continued*)

Standard number	Title
Determination of electrical properties of rubber	
BS 903-C5:1992	Methods of testing vulcanized rubber – Determination of insulation resistance
BS ISO 1853:2011	Conducting and dissipative rubbers, vulcanized or thermoplastic – Measurement of resistivity
BS ISO 2878:2011	Rubber, vulcanized or thermoplastic – Antistatic and conductive products – Determination of electrical resistance
BS 7663:1993	Methods of test for determination of permittivity and dissipation factor of electrical insulating material in sheet or tubular form
BS ISO 14309:2011	Rubber, vulcanized or thermoplastic – Determination of volume and/or surface resistivity
BS EN 60243-2:2001	Methods of test for electric strength of solid insulating materials – Part 2: Additional requirements for tests using direct voltage

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 903 (all parts), *Physical testing of rubber*

BS 2782-0, *Methods of testing plastic – Part 0: Introduction*¹⁾

BS 3424 (all parts), *Testing coated fabrics*

BS 4443 (all parts), *Methods of test for flexible cellular materials*

BS 6716, *Guide to properties and types of rubber*

BS 7825 (all parts), *Calibration of rubber and plastics test equipment*

BS ISO 1795, *Rubber, raw natural and raw synthetic – Sampling and further preparative procedures*

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

BS ISO 7267 (all parts), *Rubber-covered rollers*

ISO/TR 9272, *Rubber and rubber products – Determination of precision for test method standards*

ISO/TR 11753, *Rubber and rubber products – Confidence intervals for repeatability and reproducibility values determined by inter-laboratory tests*

PD ISO/TR 12134, *Rubber – Estimation of uncertainty for test methods – Non-functional parameters*

Other publications

- [1] Brown, R. P., *Physical Testing of Rubber*, Springer, London 2006.
- [2] Brown, R. P. (ed.), *Handbook of Polymer Testing: Physical Methods*, Marcel Dekker Inc., New York, Basel 1999.

¹⁾ Referred to in the Foreword only

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