

Calibration of rubber and plastics test equipment

Part 3. Calibration schedules

Section 3.8. Degradation and environmental properties

ICS 83.200

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/20, Accuracy of rubber and plastics test equipment, upon which the following bodies were represented:

- British Rubber Manufacturers' Association Ltd.
- GAMBICA (BEAMA Ltd.)
- Ministry of Defence
- National Physical Laboratory
- RAPRA Technology Ltd.

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on 15 June 1998

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The following BSI references relate to the work on this standard:
Committee reference PRI/20
Draft for comment 94/307321 DC

ISBN 0 580 28342 9

Amendments issued since publication

Amd. No.	Date	Text affected

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Normative references	1
3 Definitions	1
4 Inspection	1
5 Schedules	1
6 Calibration schedules for individual test methods	2
Tables	
1 BS 2782 : Method 830A : 1986	4
2 BS 2782 : Method 465A and 465B : 1979	4
3 BS 2782 : Method 465C : 1990	5
4 BS 903 : Part A19 : 1986	6
5 BS EN ISO 846 : 1997	7
6 BS EN ISO 899-2 : 1997	8
7 BS ISO 1110 : 1995	8
8 BS 7164 : Part 14 : 1996	9
9 BS 903 : Part A43 : 1990	12
10 BS 903 : Part A44 : 1995	13
11 BS 903 : Part A16 : 1987	15
12 ISO 2230 : 1973	16
13 BS 2782 : Method 821A : 1979	17
14 BS 2782 : Method 135 : 1993	17
15 BS 903 : Part A30 : 1996	18
16 BS 903 : Part A32 : 1988	19
17 ISO 4577 : 1983	20
18 BS EN ISO 4599 : 1997	21
19 BS 2782 : Method 833A to 833C : 1993	22
20 BS 903 : Part A52 : 1986	22
List of references	24

Foreword

This Section of BS 7825 has been prepared by Technical Committee PRI/20.

In commercial practice it is necessary for the parties concerned in the manufacture or supply of materials or products to operate or agree upon specified performance requirements. Those performance requirements are verified by standardized methods of test. Test result variability is influenced by both test variability and product variability. As it is product variability which needs to be identified, test variability has to be kept to a minimum. An important element in the achievement of this reduced variability is the calibration of test instrumentation, to traceable standards, at acceptable intervals.

The use of this British Standard will encourage proper calibration and make it possible for all users and calibration laboratories to work to common procedures.

BS 7825 comprises the following three separate Parts:

Part 1	<i>Principles and general requirements</i>
Part 2	<i>Calibration procedures</i>
Part 3	<i>Calibration schedules</i>

Part 3 will comprise 13 Sections, each of which will provide calibration schedules for specific areas of rubber or plastics testing, as follows:

Section 3.1	<i>Thermal properties</i>
Section 3.2	<i>Electrical properties</i>
Section 3.3	<i>Mechanical properties of plastics</i>
Section 3.4	<i>Mechanical properties of rubber</i>
Section 3.5	<i>Optical and weathering properties</i>
Section 3.6	<i>Dimensional properties</i>
Section 3.7	<i>Rheological properties</i>
Section 3.8	<i>Degradation and environmental properties</i>
Section 3.9	<i>Flammability characteristics</i>
Section 3.10	<i>Conditioning, sample and test piece preparation</i>
Section 3.11	<i>Rubber polymer identification and chemical properties</i>
Section 3.12	<i>Chemical properties of plastics</i>
Section 3.13	<i>Chemical properties of resins</i>

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, page i and ii, pages 1 to 24, an inside back cover and a back cover.

1 Scope

This Section of BS 7825 provides schedules for the calibration of a range of equipment and apparatus used for measuring the degenerative and environmental resistance properties of plastics and rubber materials.

2 Normative references

This Section of BS 7825 incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 24. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the publications apply to this part of BS 7825 only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

For the purposes of this Section of BS 7825 the definitions, where relevant, given in BS EN 30012-1, BS 5233, PD 6461 : Part 1, BS 4778 and ISO Guide 30 apply.

4 Inspection

Before any calibration is undertaken, the condition of the items to be calibrated shall be ascertained by inspection and recorded on any calibration report or certificate. It shall be reported whether calibration is made in the 'as-received' condition or after rectification of any abnormality or fault.

It shall be ascertained that the apparatus is generally fit for the intended purpose, including any requirements specified as approximate and hence not formally calibrated. If such parameters could change, then the need for periodic checks shall be written into the detailed calibration procedures.

5 Schedules

The calibration schedules given in this Section of BS 7825 have been compiled by listing all of the parameters specified in the relevant test method cited, together with the specified requirement. A parameter and requirement may relate to the main test apparatus, part of that apparatus or to an ancillary apparatus necessary for the test. In some cases tolerances not given in the test method standard have been added.

For each parameter a calibration procedure is indicated by reference to Part 2 of BS 7825, to another publication or to a procedure particular to that test method which is detailed.

The verification frequency for each parameter is given by a code letter. The code letters used in the schedules are:

Procedure:	P	Particular procedure
	R	Use of certified reference material
	C	Requirement to be confirmed but no measurement
Requirement:	*	Tolerance not specified in the test method standard
Verification:	N	Initial verification only
	S	Standard interval as given in Part 1 of BS 7825
	P	Particular interval given in the standard
	U	In use

In use checks additional to the schedule are listed separately.

A list is given of reference materials either required by the calibration schedule or otherwise required by the test method.

Reagents, including cleaning materials, are listed. In some cases a reagent may be considered as a particular type of reference material.

In addition to the items listed, some standards assume the use of 'normal' laboratory apparatus, e.g. timers, beakers etc. These may need calibrating in accordance with the appropriate procedure given in BS 7825 : Part 2. Also, there may be items specified in the relevant cited standard which have a dimension, for example a 250 ml flask. Where the size has no particular significance, other than convenience of use, these items will not require to be calibrated.

Most standards for the testing of materials require the test piece to be conditioned. This implies the use of a thermometer and possibly a hygrometer, both of which will require calibration. Conditioning and test temperatures and humidities cited in the relevant standard have not been repeated.

Test piece dimensions are usually specified. This implies the use of dimensional measuring instruments which will require calibration. Test piece dimensions cited in the relevant standard have not been repeated.

6 Calibration schedules for individual test methods

The calibration schedules relating to this Section of BS 7825 are listed below in the numerical order of the international standard to which they relate:

BS 2782 :	<i>Methods of testing plastics</i>
BS 2782 : Part 8 :	<i>Other properties</i>
BS 2782 : Method 830A : 1986	<i>Determination of the effects of liquid chemicals, including water</i> (Identical with ISO 175 : 1981)
BS 2782 : Part 4 :	<i>Chemical properties</i>
BS 2782 : Methods 465A and 465B : 1979	<i>Determination of loss of plasticizers (activated carbon method)</i> (Identical with ISO 176 : 1976)
BS 2782 : Method 465C : 1990	<i>Determination of migration of plasticizers</i> (Identical with ISO 177 : 1988)
BS 903 :	<i>Physical testing of rubber</i>
BS 903 : Part A19 : 1986	<i>Heat resistance and accelerated ageing tests</i> (Identical with ISO 188 : 1982)
BS EN ISO 846 : 1997	<i>Plastics. Evaluation of the action of microorganisms</i> (Identical with ISO 846 : 1997)
BS EN ISO 899 :	<i>Plastics. Determination of creep behaviour</i>
BS EN ISO 899-2 : 1997	<i>Flexural creep by three-point loading</i> (Identical with ISO 899-2 : 1993)
BS ISO 1110 : 1995	<i>Plastics. Polyamides. Accelerated conditioning of test specimens</i> (Identical with ISO 1110 : 1995)
BS 7164 :	<i>Chemical tests for raw and vulcanized rubber</i>
BS 7164 : Part 14 : 1996	<i>Methods for determination of carbon black content</i> (Identical with ISO 1408 : 1995)
BS 903 :	<i>Physical testing of rubber</i>
BS 903 : Part A43 : 1990	<i>Method for determination of resistance to ozone cracking</i> (static strain test) (Identical with ISO 1431-1 : 1989)
BS 903 : Part A44 : 1995	<i>Method of determination of resistance to ozone cracking</i> (dynamic strain test) (Identical with ISO 1431-2 : 1994)
BS 903 : Part A16 : 1987	<i>Determination of the effect of liquids</i> (Identical with ISO 1817 : 1985)
ISO 2230 : 1973	<i>Vulcanized rubber — Guide to storage</i>
BS 2782 :	<i>Methods of testing plastics</i>
BS 2782 : Part 8 :	<i>Other properties</i>
BS 2782 : Method 821A : 1979	<i>Determination of the gas transmission rate of films and thin sheets under atmospheric pressure (manometric method)</i> (Identical with ISO 2556 : 1974)
BS 2782 : Part 1 :	<i>Thermal properties</i>
BS 2782 : Method 135 : 1993	<i>Determination of the time-temperature limits after prolonged exposure to heat</i> (Identical with ISO 2578 : 1993)

BS 903 :	<i>Physical testing of rubber</i>
BS 903 : Part A30 : 1996	<i>Determination of permeability to gases</i> (Identical with ISO 2782 : 1995)
BS 903 : Part A32 : 1988	<i>General directions for achieving elevated or subnormal temperatures for test purposes</i> (Identical with ISO 3383 : 1985)
ISO 4577 : 1983	<i>Plastics — Polypropylene and propylene-copolymers — Determination of thermal oxidative stability in air — Oven method</i>
BS EN ISO 4599 : 1997	<i>Plastics. Determination of resistance to environmental stress cracking (ESC). Bent strip method</i> (Identical with ISO 4599 : 1986)
BS 2782 :	<i>Methods of testing plastics</i>
BS 2782 : Part 8 :	<i>Other properties</i>
BS 2782 : Methods 833A to 833C : 1993	<i>Determination of environmental stress cracking (ESC) by the constant tensile stress method</i> (Identical with ISO 6252 : 1992)
BS 903 :	<i>Physical testing of rubber</i>
BS 903 : Part A52 : 1986	<i>Determination of ageing characteristics by measurement of stress at a given elongation</i> (Identical with ISO 6914 : 1985)

Table 1. BS 2782 : Method 830A : 1986 (identical with ISO 175 : 1981)				
Parameter	Requirement	Procedure	Verification frequency	Notes
Test temperature	$\leq 105\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$	6	S	—
Balance	$> 105\text{ }^{\circ}\text{C} \leq (200\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C})$	11.1	S	—
Dial micrometer with flat anvils	Accurate to 0.01 mm	3.1	S	—
Calliper gauge	Accurate to 0.1 mm	3.1	S	—
Reagents	The reagents listed in table 2 shall be of laboratory reagent quality. Various dilutions are given but no tolerances. The reagents listed in table 3 are either to be in accordance with a standard (e.g. insulating oil in accordance with IEC 296) or the quality is to be specified (e.g. petrol (gasoline): quality to be specified)	—	—	—

Table 2. BS 2782 : Method 465A and 465B : 1979 (identical with ISO 176 : 1976)				
Parameter	Requirement	Procedure	Verification frequency	Notes
Analytical balance	Accurate to 0.001 g	11.1	S	—
Test temperature	$\pm 1\text{ }^{\circ}\text{C}$ in range	6	S	—
Bath or oven	50 °C to 150 °C	—	—	—
Cylindrical metal cages	60 mm 6 mm	3.2 3.2	N N	—
Gauze	500 µm	3.6	N+	—
Reference material	Activated carbon, well determined type and grade	—	—	Details from the Secretariat of ISO TC 61

Table 3. BS 2782 : Method 465C : 1990 (identical with ISO 177 : 1988)

Parameter	Requirement	Procedure	Verification frequency	Notes
Analytical balance	Accurate to 0.001 g	11.1	S	—
Thickness of backing discs	≥ 0.5 mm	3.2	U	—
Diameter of backing discs	$60 \text{ mm} \pm 1 \text{ mm}$	3.2	U	—
Mass of weights	$5 \text{ kg} \pm 10 \text{ g}^*$	—	—	—
Test temperature	± 2 °C	6	S	—
Air circulating oven	In the range 50 °C to 100 °C	6	—	See also clause 5
Size; and finish of glass plates	> 62 mm dia* Plane surface	3.2 3.5	N S	— —
Micrometer	0.01 mm	3.1	S	—
Reference materials	A standard rubber as in B.2 of ISO 4649 : 1995 Polyethylene without additive Polyvinyl acetate without plasticizer Absorbent backing discs shall have an affinity for plasticizers	— — — —	— — — —	— — — Also, it is pointed out that if the absorbent discs themselves contain substances capable of migrating, then simultaneous migration from absorbent sheets to test pieces may occur as well as the migration being monitored. Similarly, constituents other than plasticizers may migrate (e.g. oligomers) from test pieces or volatile constituents may be lost from either the test pieces or the absorbent discs. All these factors will markedly affect the results.