

Methods of testing vulcanized rubber —

**Part C2: Determination of volume
resistivity —**

Methods of testing plastics —

Part 2: Electrical properties —

**Method 230A: Determination of volume
resistivity**

UDC 678.01:537.311.3

Cooperating organizations

The Plastics Standards Committee and the Rubber Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

- British Association of Synthetic Rubber Manufacturers
- British Plastics Federation*
- British Resin Manufacturers' Association
- British Rubber Manufacturers' Association*
- Chemical Industries Association
- Department of Industry (Chemicals and Textiles)
- Department of the Environment (PSA)
- Department of the Environment (Building Research Establishment)
- Department of Trade (Metrology, Quality Assurance, Safety and Standards Division)
- Electrical and Electronic Insulation Association (BEAMA)*
- Electrical Installation Equipment Manufacturers' Association Limited (BEAMA)
- Engineering Equipment Users' Association
- ERA Technology Limited*
- Institution of Production Engineers
- Malaysian Rubber Producers' Research Association
- Medical Sterile Products Association
- Ministry of Defence*
- Plastics and Rubber Institute
- Post Office
- Royal Institute of British Architects
- Rubber and Plastics Research Association of Great Britain*
- Rubber Growers' Association
- Society of Chemical Industry
- Society of Motor Manufacturers and Traders Limited

The organizations marked with an asterisk in the above list were directly represented on the Technical Committee entrusted with the preparation of this British Standard.

This British Standard, having been prepared under the direction of the Plastics Standards Committee and the Rubber Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 August 1982

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Contents

	Page
Cooperating organizations	Inside front cover
Foreword	ii
0 Introduction	1
1 Scope	1
2 References	1
3 Definitions	1
4 Form of test piece	1
5 Number of test pieces	1
6 Electrodes	1
7 Apparatus	2
8 Conditioning	4
9 Conditions of test	4
10 Procedure	4
11 Calculation of results	6
12 Report	6
Appendix A Guarding	7
Appendix B High voltage supply	7
Figure 1 — Test piece, electrodes and backing plates	2
Figure 2 — Specific example of a measuring circuit	3
Publications referred to	Inside back cover

Foreword

This revision of this Part of this British Standard, which has been published under the direction of the Plastics Standards Committee and the Rubber Standards Committee, supersedes BS 903-C2:1956 and method 202A of BS 2782:1970 which are being withdrawn.

This standard includes information from BS 6233 (identical with IEC 93). The dimensions of the electrodes have been aligned with those recommended in BS 6233 and differ from those specified in the earlier editions of this standard.

This standard does not contain a revision of method 202B of BS 2782:1970 which describes a method not using a guard ring and which has been withdrawn.

In preparing this standard to cover the testing of both vulcanized rubber and plastics, there was some difficulty in reconciling the requirements for the period of conditioning the test pieces prior to testing. The internationally agreed period for vulcanized rubber is a minimum of 16 h (see BS 903-A35) but for plastics a minimum of 88 h is usual (see ISO 291). However, for most rubbers and plastics, it is considered that 16 h is adequate in the climatic conditions prevailing in the UK.

Attention is drawn to BS 4618-2.3 which gives advice on the experimental programme and subsequent presentation of data for design purposes.

WARNING NOTE. This British Standard does not necessarily detail all the precautions necessary to meet the requirements of the Health and Safety at Work etc. Act 1974. Attention should be paid to any appropriate safety precautions and the method should be operated only by trained personnel.

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 8, 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.

IMPORTANT NOTE When using this method in order to test plastics, readers are reminded that the foreword, general introduction and instructions to BS 2782-0:1982 contain important information on the testing of plastics. However, it should be noted that the conditioning requirements given in clause 8 of this Part replace those in Part 0.

0 Introduction

Volume resistance tests may be affected by a number of factors including the following: the magnitude of applied voltage, the time of voltage application, the nature and geometry of the electrodes, the temperature and humidity of the ambient atmosphere during conditioning and measurement and the temperature and moisture content of the test piece during measurement. A detailed discussion of these effects is given in BS 6233 and they have been taken into account in the preparation of this Part of this standard.

1 Scope

This British Standard gives a method for determining the electrical volume resistivity of vulcanized rubbers and plastics from the current flowing through the material when a voltage is applied to the opposite faces of a sheet of the material. The method is unsuitable when the volume resistivity is below $10^7 \Omega \text{ cm}$. Lower values should be measured by the method given in BS 2044.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1

volume resistance

the quotient of a direct voltage applied between two electrodes in contact with opposite faces of a test piece, and the current between the electrodes after one or more specified periods of electrification, excluding current along the surface. Possible polarization phenomena at the electrodes are ignored

3.2

volume resistivity

the measured volume resistance calculated to apply to a cube with unit side

NOTE It is usual to express volume resistivity in ohm centimetres ($\Omega \text{ cm}$).

4 Form of test piece

The test piece shall be a flat smooth disk or sheet sufficiently large that the guard ring does not reach its edges (see clause 6).

The variation in thickness within a given test piece shall not exceed 10 % of the mean value. Test pieces used for comparative tests shall be, as nearly as practicable, of the same thickness.

For tests on moulding material and extrusion compounds the method of preparation of the test pieces shall be as specified in the relevant British Standard for the material.

The nominal thickness of the test piece shall be between 1 mm and 3.2 mm except that sheet material and laminates shall not be reduced in thickness but tested in the thickness supplied.

5 Number of test pieces

Two test pieces shall be used.

6 Electrodes

6.1 General. The test piece shall be provided with three electrodes (see Figure 1) which shall be supplemented, after conditioning, by rigid metal backing plates. The upper backing plates shall just cover the electrodes and the bottom backing plate shall be not smaller than the bottom electrode. The backing plates shall be in good electrical contact with the electrodes.

The electrodes shall be circular, the smallest (guarded) electrode being surrounded by a guard electrode. The third electrode is the high voltage electrode. The diameters of the electrodes shall be as follows (see Figure 1):

D_1 50 mm or 150 mm

D_2 10 mm greater than D_1

D_3 30 mm greater than D_1

D_4 not less than D_3

The electrodes shall be coaxial and shall be prepared by one of the methods described in 6.2, 6.3, 6.4, 6.5 or 6.6.

6.2 Graphite electrodes. Graphite electrodes shall be applied before conditioning in the form of a colloidal suspension in water or alcohol.

NOTE 1 It is convenient to dilute the graphite suspension to the consistency of drawing ink and then to draw the circular outlines of the electrodes on the surface of the test piece, afterwards painting the appropriate areas with the graphite suspension. Alternatively, the colloidal graphite may be applied by spraying, using suitable stencils.

NOTE 2 The electrical properties of materials which readily absorb water or alcohol may be affected by the liquid in which the graphite is suspended.