

Physical testing of rubber —

Part A58: Methods using the Mooney viscometer

ICS 83.060

Committees responsible for this British Standard

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- British Railways Board
- British Rubber Manufacturers' Association
- ERA Technology Ltd.
- GAMBICA (BEAMA Ltd.)
- Institution of Mechanical Engineers
- Institution of Water Engineers and Scientists
- Malaysian Rubber Producers' Research Association
- Ministry of Defence
- National College of Rubber Technology
- Rubber and Plastics Research Association of Great Britain
- SATRA Footwear Technology Centre

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Foreword

This Part of BS 903 was prepared under the direction of the Rubber Standards Policy Committee and supersedes the methods in BS 1673-3:1969 using the shearing-disc viscometer. With the publication of this Part and BS 903-A59, which will provide methods for the determination of the rapid plasticity number and the plasticity retention index of raw natural rubber, BS 1673-3:1969 is superseded entirely and withdrawn.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 11 and a back cover.

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1 Scope

This Part of BS 903 describes two methods of test, each using the Mooney viscometer. Method 1 provides a method for determination of Mooney viscosity. Method 3 provides a method for determination of pre-vulcanization characteristics.

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

2 Definitions

For the purposes of this Part of BS 903, the following definitions apply.

2.1

Deleted

2.2

Deleted

2.1

pre-vulcanization or scorch time (t_x)

the time in minutes for the Mooney viscosity value to reach a value x units above the minimum (see 5.8)

NOTE For the large rotor x is commonly taken as 5 Mooney units or 10 Mooney units, whilst for the small rotor, x is commonly taken as 3 Mooney units.

3 Method 1. Determination of Mooney viscosity

3.1 Principle

The torque necessary to rotate a metal disc in a cylindrical chamber filled with uncompounded or compounded rubber is measured. The Mooney viscosity number is proportional to the value of the torque.

3.2 Apparatus

3.2.1 *A shearing disc viscometer*, consisting of two dies forming a cylindrical cavity, a rotor, means of maintaining the dies at a constant temperature, a means of maintaining a specified closure pressure, provision for rotating the rotor at a constant angular velocity and provision for indicating the torque required to rotate the rotor.

The dimensions of the rotor and die cavity are shown in Figure 1, measured from the highest surface.

A smaller rotor may be used where high viscosity makes this necessary. This rotor shall have the same dimensions as the large rotor except that the diameter shall be 30.48 ± 0.03 mm. Results obtained with the small rotor are not identical with those obtained using the large rotor. The two dies A and B forming the cavity shall be made from non-deforming unplated, hardened steel having a minimum Rockwell hardness of 60 HRC when tested in accordance with BS 891. Each die shall either be formed from one piece of steel having radial V-grooves on the flat surfaces or from two pieces of steel with rectangular section grooves on the surface to prevent slipping.

The radial V-grooves shall be spaced at 20° intervals and extend from an outer circle of 47 mm diameter to an inner circle of 7 mm diameter for the upper die and to within 1.5 mm of the hole in the lower die. Each groove shall form a 90° angle in the die surface, with the bisector of the angle perpendicular to the surface and shall be 1.0 ± 0.1 mm wide at the surface (see Figure 2). The rectangular section grooves shall be 0.8 ± 0.02 mm wide, of uniform depth 0.3 ± 0.05 mm and spaced on 1.6 ± 0.04 mm centres. The flat surfaces of the dies shall have two sets of these grooves at right angles to each other (see Figure 3).

NOTE Dies formed from one piece of steel are to be preferred as they exhibit better heat transfer properties.