

Australian Standard®

Methods of test for elastomers

Method 13: Compression set of vulcanized rubber under constant deflection

PREFACE

This Standard was prepared by the Standards Australia Committee on Analysis and Testing of Elastomers under the direction of the Multitechnics Standards Policy Board, to supersede AS 1683.13B—1976.

This edition is based on ASTM D 395, *Rubber property, compression set*. It differs from the 1976 edition in that the two methods of preparing test specimens are now clearly differentiated, Figure 1 has been modified and the Report Clause has been amended.

CONTENTS

	<i>Page</i>
1 SCOPE	1
2 REFERENCED DOCUMENTS	2
3 PRINCIPLE	2
4 APPARATUS	2
5 SAMPLE PREPARATION	3
6 PROCEDURE	3
7 CALCULATION	4
8 REPORT	4

FOREWORD

Compression set tests are intended to measure the ability of rubber compounds to retain elastic properties after prolonged action of compressive stresses. The actual stressing service may involve the maintenance of a definite deflection, the constant application of a known load, or the rapidly repeated deformation and recovery resulting from intermittent compressive forces. Though the latter dynamic stressing produces compression set, its effects as a whole are more closely simulated by compression flexing or hysteresis tests. Therefore, compressive set tests are considered to be only those involving static loading.

The method of test for compression set is used for vulcanized elastomers intended for rubber parts that are to be assembled in such a manner that the rubber will be subjected to compressive stresses or shear. It is applicable particularly to the rubber used in machinery mountings, vibration dampers, seals, gaskets and O-rings.

METHOD

1 SCOPE This Standard sets out a method for determining the compression set of vulcanized rubber under constant deflection.

NOTE: The method is not suitable for vulcanizates in excess of 90 IRHD.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

1683 Methods of test for elastomers

1683.15.1 Method 15.1: International rubber hardness

ASTM

D 3182 Recommended practice for standard materials, equipment and procedures for mixing rubber compounds and for preparing vulcanized test sheets

3 PRINCIPLE The residual deformation of a test specimen is measured after removal from a suitable compression device in which the specimen has been subjected to compressive deformation under specified conditions.

4 APPARATUS

4.1 Cutting dies Circular dies used for cutting the test specimens shall be carefully maintained so that the cutting edges are sharp and free of nicks. Either of two types of circular cutting dies, having the following inside diameters, may be used:

- (a) *Type 1 cutting die* The circular die for preparing Type 1 test specimens shall have an inside diameter of 29.0 ± 0.5 mm.
- (b) *Type 2 cutting die* The circular die for preparing Type 2 test specimens shall have an inside diameter of 13.0 ± 0.2 mm.

4.2 Mould A mould of suitable dimensions is used to produce test specimens (see also Clause 5).

4.3 Dial micrometer Where a dial micrometer is used to measure the thickness of the specimen, it shall have an anvil of 9.5 ± 0.5 mm in diameter and a hemispherical presser foot 6 ± 1 mm in diameter, and shall be graduated to 0.01 mm. The force exerted by the presser foot shall be 0.8 ± 0.1 N.

NOTE: Other ways of measuring specimen thickness before and after testing may be used if specified by the purchaser. For vulcanizates having a hardness below 35 IRHD as determined in accordance with AS 1683.15.1, the force exerted by the presser foot should be reduced to 0.20 ± 0.05 N.

4.4 Spacers Spacers used for maintaining the constant deflection of 25% required in the test shall be of the following thicknesses:

- (a) Spacers for Type 1 test specimens shall have a thickness of 9.38 ± 0.02 mm.
- (b) Spacers for Type 2 test specimens shall have a thickness of 4.50 ± 0.01 mm.

4.5 Plates The plates between which the test specimen is compressed shall be made of steel of sufficient thickness to withstand the compressive stresses without bending. The surface against which the specimen is held shall have a highly polished chromium-plated finish and shall be thoroughly cleaned and wiped dry before each test.

4.6 Compression device The compression device used shall consist of two or more flat steel plates between the parallel faces of which the specimens may be compressed, as shown in Figure 1. Steel spacers for the required percentage of compression (see Clause 6(b)) shall be placed on each side of the rubber specimens to control their thickness while compressed. The steel surfaces contacting the rubber specimens shall be ground to a maximum roughness of $0.25 \mu\text{m}$ and then chromium plated and polished. The surfaces shall be thoroughly cleaned before each use and, if desired, lubricated. Where a lubricant is applied it shall consist of a thin coating of a fluid having substantially no action on rubber. For most purposes a silicone fluid is suitable.

NOTE: Lubrication of the operating surfaces of the compression apparatus is optional. Although giving more reproducible results, lubrication may somewhat alter the compression set values.

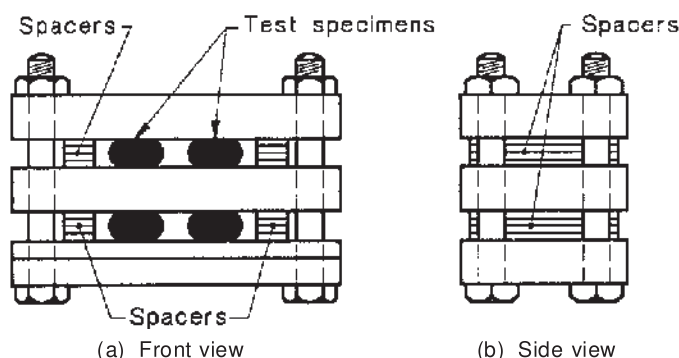


FIGURE 1 DEVICE FOR COMPRESSION SET TEST UNDER CONSTANT DEFLECTION