

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard Methods of Test
for
RUBBER

METHOD 18. VULCANIZED RUBBERS—
DETERMINATION OF RESISTANCE TO
FLEX CRACKING (DE MATTIA TYPE
MACHINE)*

FOREWORD

Repeated bending or flexing of a rubber vulcanizate causes cracks to develop in that part of the surface where tension stress is set up during flexing or, if this part of the surface contains a crack, causes this crack to extend in a direction perpendicular to the stress. Certain soft vulcanizates show marked resistance to crack initiation, but it is possible for these vulcanizates to have a low resistance to growth (propagation) of cracks.

It is important, therefore, to measure both the resistance to crack initiation by flexing and the resistance to crack propagation.

Note: A method for determining the resistance to growth of an artificially introduced cut is given in ISO 133, Vulcanized Rubbers—Determination of Resistance to Crack Growth (De Mattia Type Machine).

METHOD

1 SCOPE. This standard sets out a method for comparing the resistance of rubbers to the formation and growth of the cracks, when subjected to repeated flexing on the De Mattia type machine.

2 APPARATUS. A De Mattia type machine is required, the essential features of which are as follows:

Stationary parts, provided with grips for holding one end of each of the test pieces in a fixed position, and similar but reciprocating parts for holding the other end of each of the test pieces. The travel is 57.15 ± 0.1 mm and is such that the maximum distance between each set of opposing grips is $75.0+1.2, -0$ mm (see Fig. 1).

The reciprocating parts are so arranged that their motion is straight, and in the direction of, and in the same plane as the common centreline of each opposing pair of grips. The planes of the gripping surfaces of each opposing pair of grips remain parallel throughout the motion.

* Derived from and essentially the method described in ISO 132-1975 (E), Vulcanized Rubbers—Determination of Resistance to Flex Cracking (De Mattia Type Machine).

The eccentric which actuates the reciprocating parts is driven by a constant-speed motor to give 5.00 ± 0.17 Hz, with sufficient power to flex at least six, and preferably twelve, test pieces at one test. The grips hold the test pieces firmly, without undue compression, and enable individual adjustment to be made to the test pieces to ensure accurate insertion.

For testing at elevated temperatures, the machine may be enclosed in a chamber with temperature controlled to $\pm 3^\circ\text{C}$, if necessary, by using an air-circulator, the temperature to be measured near the centre of the test piece.

Note: It is useful to arrange the test pieces in two equal groups, so that one group is being flexed while the other group is being straightened, thus reducing the vibration in the machine.

3 TEST PIECE.

3.1 Form and Dimensions. The test piece shall be a strip with a moulded groove, as shown in Fig. 2. The strips may be moulded individually in a multiple-cavity mould or may be cut from a wide slab having a moulded groove.

The groove in the test piece shall have a smooth surface and be free from irregularities from which cracks may start prematurely. The groove shall be moulded into the test piece or slab by a half-round ridge in the centre of the cavity. This half-round ridge shall have a radius of 2.38 ± 0.03 mm. The moulded groove shall be perpendicular to the direction of the grain.

The results shall be compared only between test pieces having thicknesses agreeing within the tolerances when measured close to the groove, because the results of the test are dependent upon the thickness of the test piece.

3.2 Preparation of Standard Vulcanized Test Piece.

3.2.1 Conditioning of milled stock. Milled stock shall be conditioned for 2 h to 24 h at $23 \pm 2^\circ\text{C}$, preferably in a closed container to prevent absorption of moisture from the air.

3.2.2 Time lapse between vulcanization and testing. For all test purposes, the minimum time between vulcanization and testing shall be 16 h.

Test pieces shall be protected from light as completely as possible.

3.3 Conditioning.

3.3.1 For tests at a standard laboratory temperature (see Clause 4). Individually moulded test pieces, after preparation as necessary, shall be conditioned at the test temperature for a minimum of 3 h immediately before testing. The same temperature shall be used throughout any test or series of tests intended to be comparable. Slab samples shall be similarly conditioned before the test pieces are cut. These test pieces may be either tested immediately or kept at the test temperature until tested.

3.3.2 For tests at other temperature (see Clause 4). After the conditioning period specified above, the test pieces shall be brought to the test temperature by keeping in a chamber at this temperature for $3 \text{ h} \pm 15 \text{ min}$ in a relaxed position.