



Standard Test Method for Rubber Property—Vulcanization Using Oscillating Disk Cure Meter¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method describes the use of the oscillating disk cure meter for determining selected vulcanization characteristics of vulcanizable rubber compounds.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 ISO 3417 is very similar to this test method. It has minor technical differences that are not considered to be significant.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 1349 Practice for Rubber—Standard Temperatures for Testing²

D 3185 Test Methods for Rubber—Evaluation of SBR (Styrene-Butadiene Rubber) Including Mixtures With Oil²

D 3186 Test Methods for Rubber—Evaluation of SBR (Styrene-Butadiene Rubber) Mixed With Carbon Black or Carbon Black and Oil²

D 3187 Test Methods for Rubber—Evaluation of NBR (Acrylonitrile-Butadiene Rubber)²

D 3190 Test Methods for Rubber—Evaluation of Chloroprene Rubber (CR)²

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries²

2.2 ISO Standard:

ISO 3417 Rubber—Measurement of Vulcanization Characteristics With the Oscillating Disk Rheometer³

¹ This test method is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.12 on Processability Tests.

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² *Annual Book of ASTM Standards*, Vol 09.01.

³ Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 The following measurements may be taken from the curve of torque versus time (see Fig. 1).

3.1.2 *cure rate index*—measure of rate of vulcanization based on the difference between optimum vulcanization and incipient scorch time.

3.1.3 *maximum, plateau, or highest torque*—measure of stiffness or shear modulus of the fully vulcanized test specimen at the vulcanization temperature.

3.1.4 *minimum torque*—measure of the stiffness of the unvulcanized test specimen taken at the lowest point of the curve.

3.1.5 *time to incipient cure (scorch time)*—measure of the time at which vulcanization begins.

3.1.6 *time to a percentage of full cure*—measure of optimum cure based on the time to develop some percentage of the highest torque or difference in torque from the minimum.

3.1.7 *torque—for an oscillating shear cure meter*, the value measured by a torque transducer at the peak strain amplitude of the oscillating cycle.

4. Summary of Test Method

4.1 A test specimen of vulcanizable rubber compound is inserted into the cure meter test cavity and after a closure action is contained in a sealed cavity under positive pressure. The cavity is maintained at some elevated vulcanization temperature. The rubber totally surrounds a biconical disk after the dies are closed (see Fig. 2). The disk is oscillated through a small rotational amplitude (1° or 3°) and this action exerts a shear strain on the test specimen. The force required to oscillate or rotate the disk to maximum amplitude is continuously recorded as a function of time, with the force being proportional to the shear modulus (stiffness) of the test specimen at the test temperature. This stiffness first decreases as it warms up; then it increases due to vulcanization. The test is completed when the recorded torque either rises to an equilibrium or maximum value, or when a predetermined time has elapsed. The time required to obtain a cure curve is a function of the