



Designation: D 3194 – 99

Standard Test Method for Rubber From Natural Sources—Plasticity Retention Index (PRI)¹

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1. Scope

1.1 This test method gives an indication of the oxidation resistance of raw natural rubber at a specified temperature. This resistance is indicated by the Plasticity Retention Index (PRI), a ratio expressed as a percentage of the aged plasticity to the original plasticity determined by means of a parallel plate plastimeter. A low PRI value indicates a poor resistance to oxidation.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *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 1485 Test Methods for Rubber from Natural Sources—Sampling and Sample Preparation²
- D 3040 Practice for Preparing Precision Statements for Standards Related to Rubber and Rubber Testing³
- D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets²
- E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens⁴

3. Summary of Test Method

3.1 A homogenized sample of raw rubber is prepared by a specified procedure to create a sheet from which six cylindrical pellets of specified dimensions are cut, three to be tested in original condition and three to be aged under specified conditions.

3.2 Plasticity on both the original and aged samples is measured as the median final thickness of each set of samples after a compressive force of $100\text{ N} \pm 1\text{ N}$ is applied for a specified time. The PRI is the ratio expressed as a percentage of the aged to the original plasticity.

4. Significance and Use

4.1 This test method may be used to evaluate the heat and/or oxidation stability (aging) of raw rubber under controlled conditions. High original and aged plasticity values usually correspond to good aging properties. The ratio of the aged to original plasticity values expressed as a percentage, the PRI, is used as an indication of aging.

5. Apparatus

5.1 *Parallel Plate Plastimeter*⁵, with a 10 mm diameter platen. The platen temperature shall be $100 \pm 1^\circ\text{C}$ and the plastimeter shall have a timer unit capable of giving a $15 \pm 1\text{ s}$ initial conditioning period during which the sample shall be compressed to $1 \pm 0.01\text{ mm}$ and a test period of $15 \pm 1\text{ s}$ under a compression force of $100\text{ N} \pm 1\text{ N}$. The plastimeter shall also have a measuring device gauge reading to 0.01 mm. Calibration procedures recommended by the manufacturer of the plastimeter should be followed.

5.2 *Punch*, that will die out cylindrical specimens approximately 13 mm in diameter from a prepared sheet of rubber.

5.3 *Circulating Air Oven*, specified in Specification E 145, Type IIA. The oven must be capable of maintaining $140 \pm 0.5^\circ\text{C}$.

5.4 *Dishes or Tray*, aluminum, for test specimens, lightweight aluminum dishes approximately 38 mm (1.5 in.) in diameter or an aluminum tray approximately 150 by 150 mm (7 by 7 in.) for aging specimens in the oven.

5.5 *Tissue paper or cigarette paper*, approximately 40 by 40 mm (1.5 by 1.5 in.). This paper shall be bleached, unglazed acid-free tissue paper, of approximately 1.7 g/m^2 .

¹ This method is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.22 on Natural Rubber.

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

³ Discontinued—see 1986 *Annual Book of ASTM Standards*, Vols 09.01 and 09.02.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ The Wallace Rapid Plastimeter, available from the Leverett A. Anderson Co., P.O. Box 5400, Akron, OH 44313, has been found to be satisfactory for this method.