



Designation: D 6090 – 99

Standard Test Method for Softening Point Resins (Mettler Cup and Ball Method)¹

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1. Scope

1.1 This test method covers the determination of softening point of resins using a Mettler cup and ball apparatus, and may, under user-defined conditions, give results comparable to those obtained by Test Method E 28.

1.2 *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:

E 28 Test Method for Softening Point by Ring-and-Ball Apparatus²

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods³

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method³

3. Summary of Test Method

3.1 In this test method, the softening point is defined as the temperature at which the sample, suspended in a cylindrical cup with a 6.35-mm hole in the bottom and with a stainless steel ball, 8 mm in diameter, centered on top of the sample in the cup, flows downward a distance of 19 mm to interrupt a light beam, as the sample is heated at a linear rate in air.

4. Significance and Use

4.1 In general, with materials of these types, softening point does not take place at a definite temperature. As the temperature rises, these materials gradually change from brittle or exceedingly thick and slow-flowing materials to softer and less viscous liquids. For this reason, the determination of the softening point must be made by a fixed, arbitrary, and closely defined method if the results obtained are to be comparable.

¹ This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.34 on Naval Stores.

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² *Annual Book of ASTM Standards*, Vol 06.03.

³ *Annual Book of ASTM Standards*, Vol 14.02.

5. Apparatus

5.1 *Softening Point Apparatus*⁴—This commercially available instrument consists of a control unit with a digital temperature indicator; matched measuring cell; cartridge assembly, consisting of a sample cup and upper portion; and accessories. The control unit automatically regulates the heating rate of the measuring cell. The softening point is indicated on the readout, and the heating program stopped, when the sample flow triggers a photocell detector.

5.2 *Central Processor*—This unit shall provide a continuous, linear temperature increase from 25 to 375°C.

5.3 *Measuring Cell*— This unit shall be capable of heating a sample cup assembly, as described in 5.4, at a linear rate with an accuracy of $\pm 0.2^\circ\text{C}/\text{min}$. It shall include a sensing system capable of detecting the softening point with a precision of 0.1°C.

5.4 *Sample Cup Assembly*—A cup of chromium-plated brass and an upper portion, conforming to the dimensions shown in Fig. 1.

5.5 *Ball*—A stainless steel ball, 8.7 mm (11/32 in.) in diameter, weighing 2.77 ± 0.02 g.

6. Calibration of Apparatus Using a Primary Standard

6.1 This step, required only occasionally, is designed to establish that the temperature indicated by the instrument is in agreement with a known standard. A special cup with a bottom orifice of 2.8 mm is used instead of the one specified for testing the resin.

NOTE 1—The stainless steel ball is not used during calibration.

6.2 *Reagent*—Use either analytical reagent or primary standard grade benzoic acid for the calibration. As this material is hygroscopic, it must be stored in a tightly sealed container, and replaced with fresh material from a newly opened supply if hydration or other contamination is suspected.

6.3 Procedure:

6.3.1 *Filling the Sample Cup*—Place the cup on a clean, flat surface and fill it with benzoic acid crystals. Hand press the

⁴ The sole source of supply of the apparatus FP90/FP83HT, known to the committee at this time is the Mettler-Toledo, Inc., Princeton-Hightstown Rd., Hightstown, NJ 08520. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.