



Designation: F 1957 – 99

Standard Test Method for Composite Foam Hardness-Durometer Hardness¹

This standard is issued under the fixed designation F 1957; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes a type of composite foam hardness measurement device known as durometer: Type CF. The procedure for determining indentation hardness of substances comprised of two or more elastomeric materials, one of which is a foam or foam like material. These are classified as composite foam structures. The composite foam product may have an armature made of a material suitable for adding structural integrity including but not limited to metal, plastic, or wood. This construction is typical for lapbar restraints, seating, and other restraint devices, as well as some show elements.

1.2 This test method is not equivalent to other indentation hardness methods and instrument types, specifically those described in Test Methods D 1415D 1415 and D 2240D 2240.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only. Many of the stated dimensions in SI are direct conversions from the U.S. customary system to accommodate the instrumentation, practices, and procedures that existed prior to the Metric Conversion Act of 1975.

1.4 All materials, instruments, or equipment used for the determination of mass or dimension shall have traceability to the National Institute for Standards and Technology (NIST) or other internationally recognized organizations.

1.5 This test method is not a safety standard as it pertains to ride legislation. The use of this test method is optional based upon an agreement between customers and suppliers of foam products.

1.6 *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 374 Test Methods for Thickness of Solid Electrical Insulation²

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing³

D 785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials³

D 1349 Practice for Rubber—Standard Temperatures for Testing⁴

D 1415 Test Method for Rubber Property—International Hardness⁴

D 2240 Test Method for Rubber Property—Durometer Hardness⁴

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries⁴

3. Summary of Test Method

3.1 This test method permits hardness measurements based on either initial indentation or indentation after a specified period of time, or both.

3.2 Those specimens, which have a durometer hardness range other than specified, shall use another suitable procedure for determining durometer hardness.

4. Significance and Use

4.1 This test method is based on the penetration by a specific type of indenter when forced into the material under specified conditions. The indentation hardness is related inversely to the penetration and is dependent on the elastic modulus and viscoelastic behavior of the material. The geometry of the indenter and the applied force influence the measurements, such that no simple relationship exists between the measurements obtained with one type of durometer and those obtained with another type of durometer or other instruments used for measuring hardness. This test method is an empirical test intended primarily for control purposes. No simple relationship exists between indentation hardness determined by this test method and any fundamental property of the material tested. For specification purposes it is recommended that Test Method D 785D 785 be used for hard materials and Test Method D 2240D 2240 be used for solid elastomers.

5. Apparatus

5.1 Hardness measurement apparatus, or durometer, consisting of the following components:

¹ This test method is under the jurisdiction of ASTM Committee F-24 on Amusement Rides and Devices and is the direct responsibility of F24.10 on Test Methods.

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² Annual Book of ASTM Standards, Vol 10.01.

³ Annual Book of ASTM Standards, Vol 08.01.

⁴ Annual Book of ASTM Standards, Vol 09.01.

5.1.1 *Presser Foot*, with an orifice (to allow for the protrusion of the indenter) having a diameter as specified in Fig. 1 with the center a minimum of 38.0 mm (1.5 in.) from any edge of the flat circular presser foot.

5.1.2 *Indenter*, formed from steel rod, shaped in accordance with Fig. 2, polished over the contact area so that no flaws are visible under 20× magnification and with an indenter extension of 7.62 ± 0.04 mm ($.300 \pm 0.002$ in.).

5.1.3 *Indenter Extension Indicating Display*, (analog or digital electronic), having a display that is an inverse function of the indenter extension.

5.1.3.1 *Digital Electronic Indicating Displays* shall indicate from 0 to 100, with no less than 100 equal divisions throughout the range, at a rate of one hardness point for each 0.050 mm (0.002 in.) of indenter movement.

5.1.3.2 *Analog Indicating Displays* shall indicate from 0 to 100, with no less than 100 equal divisions throughout the range or alternatively with no less than 90 equal divisions throughout a

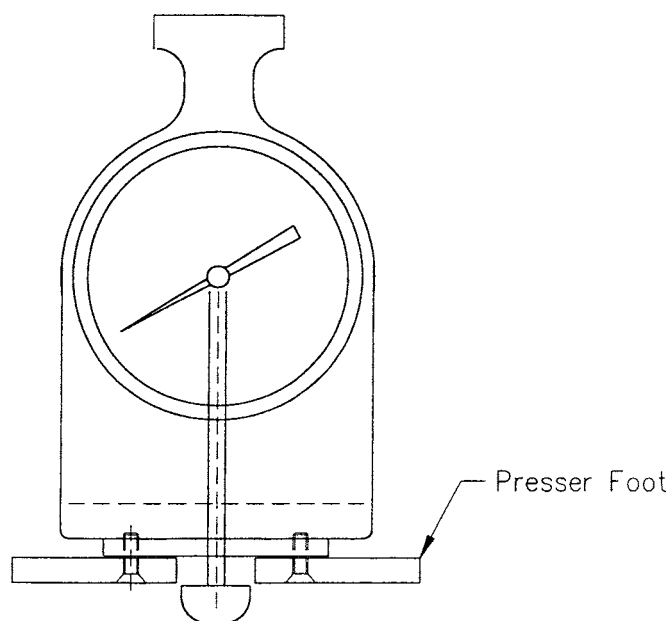


FIG. 1 Presser Foot Detail

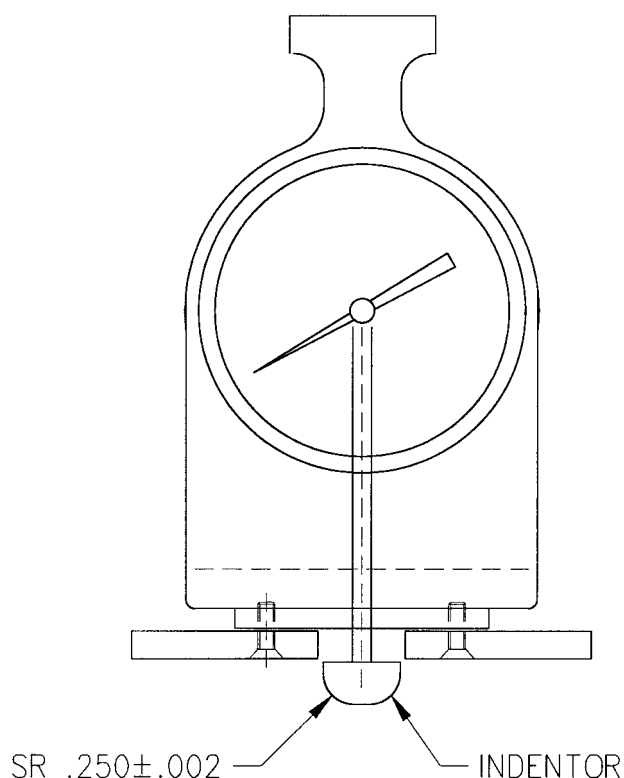


FIG. 2 Indenter Detail

range from 10 to 100, at a rate of one hardness point for each 0.050 mm (0.002 in.) of indenter movement.

5.1.4 *Maximum Indicators (optional)*, maximum indicating pointers are auxiliary analog indicating hands designed to remain at the maximum hardness value attained until reset by the operator. Electronic maximum indicators are digital displays electronically indicating and maintaining the maximum value hardness value achieved, until reset by the operator.

5.1.4.1 Analog maximum indicating pointers have been shown to have a nominal influence on the values attained; however, this influence is greater on durometers of lesser total mainspring forces. The influence of a maximum indicating pointer shall be noted at the time of acceptance.