



Standard Practice for Scleroscope Hardness Testing of Metallic Materials¹

This standard is issued under the fixed designation E448; 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 practice covers the determination of the Scleroscope² hardness of metallic materials (Part A), the verification of Scleroscope hardness instruments (Part B), and the calibration of standardized hardness test blocks (Part C).

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety problems, 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:*³

[A427 Specification for Wrought Alloy Steel Rolls for Cold and Hot Reduction](#)

[E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness](#)

3. Terminology

3.1 Definitions:

¹ This practice is under the jurisdiction of ASTM Committee E28 on Mechanical Testing and is the direct responsibility of E28.06 on Indentation Hardness Testing.

Current edition approved Sept. 1, 2008. Published January 2009. Originally approved in 1972. Last previous edition approved in 2002 as E448 – 82 (2002)^{ε1}.

² Registered trademark of the Shore Instrument & Mfg. Co., Inc. DOI: 10.1520/E0448-82R08.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.1 *calibration*—determination of the values of the significant parameters by comparison with values indicated by a reference instrument or by a set of reference standards.

3.1.2 *forged roll Scleroscope hardness number (HFRSc or HFRSd)*⁴—a number related to the height of rebound of a diamond-tipped hammer dropped on a forged steel roll. It is measured on a scale determined by dividing into 100 units the average rebound of a hammer from a forged steel roll of accepted maximum hardness.

NOTE 1—The flat striking surface of the hammer in the forged roll Scleroscope is slightly larger than the corresponding surface in the Scleroscope described in 3.1.3 (see Fig. 1). Hence the forged roll Scleroscope yields correspondingly higher hardness numbers.

3.1.3 *Scleroscope hardness number (HSc or HSd)*—a number related to the height of rebound of a diamond-tipped hammer dropped on the material being tested. It is measured on a scale determined by dividing into 100 units the average rebound of the hammer from a quenched (to maximum hardness) and untempered high carbon water-hardening tool steel test block of AISI W-5.

3.1.4 *Scleroscope hardness test*—a dynamic indentation hardness test using a calibrated instrument that drops a diamond-tipped hammer (Note 2) from a fixed height onto the surface of the material under test. The height of rebound of the hammer is a measure of the hardness of the material.

NOTE 2—An all-steel “Magnifier Hammer” that yielded a greater spread in hardness readings on soft nonferrous metals has been available. This hammer has become obsolete and, hence, is not considered in this practice.

3.1.5 *verification*—confirmation by examination and provision of evidence that an instrument, material, reference or standard is in conformance with a specification.

⁴ The conversion from Forged Roll “C” Scleroscope hardness to Vickers hardness contained in Specification A427 and to Rockwell C hardness contained in Standard E140 are presently the only Scleroscope hardness conversions in ASTM standards.

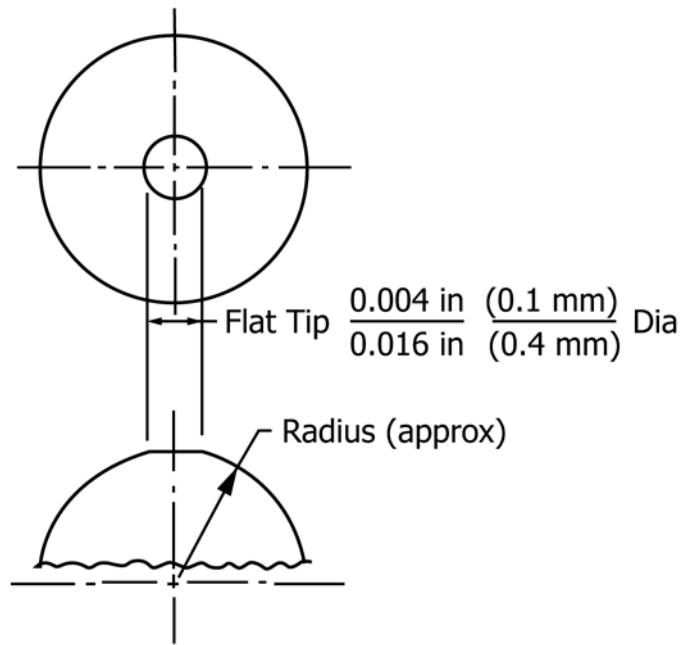


FIG. 1 Profile of Scleroscope Diamond Showing Range of Diameters of Flat Tip

GENERAL DESCRIPTION OF INSTRUMENTS AND TEST PROCEDURE FOR SCLEROSCOPE HARDNESS TEST

4. Apparatus

4.1 The instrument used for determining Scleroscope hardness numbers is supplied in two models designated Model C and Model D.⁵

4.2 *Scleroscope Model C*—This model consists of a vertically disposed barrel containing a precision bore glass tube. A scale, graduated from 0 to 140, is set behind and is visible through the glass tube. A pneumatic actuating head, affixed to the top of the barrel, is manually operated by a rubber bulb and tube. A hammer drops from a specified height and rebounds within the glass tube.

4.3 *Scleroscope Model D*—This model is known as the Dial Recording Scleroscope. It consists of a vertically disposed barrel containing a clutch to arrest the hammer at maximum height of rebound. This is made possible by using a hammer which is longer and heavier than the hammer in the Model C Scleroscope, and which develops the same striking energy in dropping through a shorter distance. A number of supporting devices are available with this instrument and it is recommended that one of these be used (see section 4.5).

4.4 Diamond-Tipped Hammers:

4.4.1 There are two sizes of diamond-tipped hammers commonly used in the Scleroscope hardness instruments. These are the small hammer used in the Model C instrument and the larger hammer used in the Model D instrument.

4.4.2 The following dimensions are applicable to the diamond-tipped hammers:

	Model C
Diameter	0.234 in. (5.94 mm)
Mass	2.300 ± 0.500 g
Over-all length	0.815 to 0.840 in. (20.7 to 21.3 mm)
Distance hammer falls	9.890 + 0.005, -0.015 in. (251.2 + 0.1, -0.4 mm)
	Model D
Diameter	0.3125 in. (7.94 mm)
Mass	36.0 ± 2.0 g
Over-all length	3.990 to 4.010 in. (101.33 to 104.10 mm)
Distance hammer falls	0.704 + 0.017, -0.021 in. (17.9 + 0.4, -0.5 mm)

4.4.3 The geometry of the diamond tip is of significance only at its ultimate extremity because of the limited penetration of the diamond into the material being tested. Such penetration is about 0.001 in. (0.025 mm) on mild steel and about 0.0005 in. (0.013 mm) on hardened tool steel. Further, the variation in hardness of commercially available industrial diamonds has a significant effect on the readings of a rebound-type hardness instrument. Consequently, the geometry of the diamond must be shaped to produce a correct reading on reference bars of known hardness. In the forged roll Scleroscope the diamond tip is specifically dimensioned to produce a correct reading on a

⁵ The sole source of supply of the Model C and D Scleroscopes known to the committee at this time is the Shore Instrument and Manufacturing Co., Inc., Jamaica, NY. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,² which you may attend.