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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Hardness Testing of Cemented Carbides¹

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1. Scope

1.1 This test method covers the hardness testing of cemented carbides by use of the Rockwell hardness tester with the Rockwell A scale (diamond indenter and 588.4 N (60 kgf) load) in the range of Rockwell A80 and above. Also covered are the procedures for the testing and selection of diamond indenters, the management and traceability of the four levels of standard test blocks, the acquisition of secondary standard test blocks, and the making and calibration of working standard test blocks.

1.2 The Rockwell hardness tester is a convenient and reliable means of measuring the hardness of cemented carbides. A hardness value is obtained easily, but it is subject to considerable error unless certain precautions are observed.

1.3 Test Methods E 18 shall be followed except where otherwise indicated in this test method.

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

1.5 *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 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications³

2.2 ISO Standard:

3738-2 Hardmetals—Rockwell hardness test (Scale A)—Part 2, Preparation and calibration of standard test blocks⁴

3. Significance and Use

3.1 Rockwell hardness is one of the more important properties used to evaluate cemented carbides. For compositional groups of cemented carbides, hardness is an indication of wear resistance and toughness. Lower hardness grades usually indicate less wear resistance but greater toughness. For a specific grade of cemented carbide, hardness is an indication of the metallurgical quality of the material. In no case is hardness the only property to be considered in evaluating cemented carbides.

4. Apparatus

4.1 *Scale*—All hardness tests shall be made on the regular (as opposed to superficial) Rockwell tester, using a 588.4 N (60 kgf) load (Rockwell A scale).

4.2 *Effect of Vibration*—The Rockwell hardness tester should be located in a vibration-free area in order to avoid erroneous results. If this is not possible, the tester shall be mounted so as to minimize vibrations, since vibrations tend to cause erratic readings.

4.3 *Indenter*—The standard indenter shall be selected, in accordance with the Annex to this test method, from diamond cone indenters specified for Rockwell A scale use and in conformance with Test Methods E 18.

4.3.1 The indenter, and an indentation made with it, in hardened steel or cemented carbide should be examined optically at approximately 50-diameter magnification for defects, conformance to shape, and mounting of the diamond. Examination should be made when selecting an indenter, occasionally during use, and whenever some event may be suspected of having damaged the diamond or its mounting.

4.4 *Anvils*—Select an anvil suitable for the specimen to be tested. The shoulder of the screw and the mating surface of the anvil should be clean. Seat the anvil securely. For the best accuracy, flat test pieces should be tested on a flat anvil of approximately 6-mm ($\frac{1}{4}$ -in.) diameter. The bearing surface of this anvil, with a Rockwell C hardness of at least 60, shall be polished smooth and be free of pits and heavy scratches. The test piece should be supported suitably, with the test surface perpendicular to the line of travel of the indenter. Dust, dirt, grease, or scale should not be allowed to accumulate on any part of the apparatus, as this will affect the results.

4.5 *Test Blocks*—Secondary standard test blocks or working standard test blocks that have been prepared and calibrated in

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² Annual Book of ASTM Standards, Vol 03.01.

³ Annual Book of ASTM Standards, Vol 14.02.

⁴ Available from American National Standards Institute, 11 W. 42nd St., 13th floor, New York, NY 10036.