



Designation: D1474/D1474M – 13 (Reapproved 2023)

Standard Test Methods for Indentation Hardness of Organic Coatings¹

This standard is issued under the fixed designation D1474/D1474M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These test methods cover the determination of the indentation hardness of organic materials such as dried paint, varnish, and lacquer coatings, when applied to an acceptable plane rigid surface, for example, metal or glass.

1.2 Two methods are covered as follows:

Method A—Knoop Indentation Hardness	Sections 6 – 12
Method B—Pfund Indentation Hardness	13 – 19

1.3 Method A, which has the greater precision, provides hardness values in terms of Knoop Hardness Number (KHN). Method B provides hardness in terms of Pfund Hardness Number (PHN). Although the hardness value scales of these methods differ, the methods agree in the ranking of coating hardness.

1.4 Test Method A of these test methods is similar in content (but not technically equivalent) to ISO 6441-1 and ISO 6441-2.

1.5 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.6 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ These test methods are under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

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2. Referenced Documents

2.1 ASTM Standards:²

- D823 Practices for Producing Films of Uniform Thickness of Paint, Coatings and Related Products on Test Panels
- D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers
- D7091 Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
- E384 Test Method for Microindentation Hardness of Materials

2.2 Other Standards:

- ISO 6441-1 Paints and Varnishes—Determination of micro-indentation hardness—Part 1: Knoop hardness by measurement of the indentation length³
- ISO 6441-2 Paints and Varnishes—Determination of micro-indentation hardness—Part 2: Knoop hardness by measurement of the indentation depth under load³

3. Terminology

3.1 Definitions:

3.1.1 *indentation hardness, n*—the resistance to penetration by an indenter.

3.1.2 *Knoop indenter, n*—a pyramidal diamond of prescribed dimensions.

3.1.3 *Pfund indenter, n*—hemispherical quartz or sapphire indenter of prescribed dimensions.

3.1.4 *Knoop hardness number, KHN, n*—the indentation hardness determined with a Knoop indenter, and calculated as follows:

$$KHN = L/A_p = L/l^2 C_p \quad (1)$$

where:

L = load applied to the indenter, kg,

² 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 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.