



Designation: E92 - 17

## Standard Test Methods for Vickers Hardness and Knoop Hardness of Metallic Materials<sup>1</sup>

This standard is issued under the standard designation E92; the number immediately following the designation indicates the year of original adoption or, in the case of revisions, the year of last revision. A number in parentheses indicates the year of last approval. A superscript symbol (n) indicates an editorial change since the last revision or approval.

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

### 1. Scope<sup>2</sup>

1.1 These test methods cover the determination of the Vickers hardness and Knoop hardness of metallic materials by the Vickers and Knoop indentation hardness principles. This standard provides the requirements for Vickers and Knoop hardness machines and the procedures for performing Vickers and Knoop hardness tests.

1.2 This standard includes additional requirements in an annex:

Validation of Vickers and Knoop Hardness Testing Machines	Annex A1
Vickers and Knoop Hardness Measuring Machines	Annex A2
Standardization of Vickers and Knoop Indenters	Annex A3
Standardization of Vickers and Knoop Indentation Test Blocks	Annex A4
Common Factors for Vickers Hardness Tests Made on Specimen and Curved Surfaces	Annex A5

1.3 This standard includes nonmandatory information in an appendix which relates to the Vickers and Knoop hardness tests:

Examples of Procedures for Determining Vickers and Knoop Hardness Uncertainty	Appendix A1
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1.4 This test method covers Vickers hardness tests made utilizing test forces ranging from  $9.807 \times 10^{-2}$  N to 1176.80 N (1 gf to 120 kgf), and Knoop hardness tests made utilizing test forces from  $9.807 \times 10^{-2}$  N to 19.613 N (1 gf to 2 kgf).

1.5 Additional information on the procedures and guidance when testing in the microindentation force range (forces  $\leq 1$  kgf) may be found in Test Method E384, Test Method for Microindentation Hardness of Materials.

1.6 Units—When the Vickers and Knoop hardness tests were developed, the force levels were specified in units of grams-force (gf) and kilograms-force (kgf). This standard specifies the units of force and length in the International System of Units (SI); that is, force in Newtons (N) and length in mm or  $\mu$ m. However, because of the historical precedent and

continued common usage, force values in gf and kgf units are provided for information and much of the discussion in this standard as well as the method of reporting the test results refers to these units.

Note 1—The Vickers and Knoop hardness numbers were originally defined in terms of the test force in kilograms-force (kgf) and the surface area or projected area in millimeters squared ( $\text{mm}^2$ ). Today, the hardness numbers are internationally defined in terms of SI units, that is, the test force in Newtons (N). However, in practice, the most commonly used force units are kilograms-force (kgf) and grams-force (gf). When Newton units of force are used, the force must be divided by the conversion factor 9.80665 N/kgf.

1.7 The test principles, testing procedures, and verification procedures are essentially identical for both the Vickers and Knoop hardness tests. The significant differences between the two tests are the geometries of the respective indenters, the method of calculation of the hardness numbers, and that Vickers hardness may be used at higher force levels than Knoop hardness.

Note 2—While Committee E92 is primarily concerned with metallic materials, the test procedures described are applicable to other materials. Other materials may require special considerations, for example see E1059 and E1057 for ceramic testing.

1.8 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.

1.9 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 Barrier to Trade (TBT) Committee.

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee E29 on Mechanical Testing and in the direct responsibility of Subcommittee E29.05 on Indentation Hardness Testing.

Current edition approved April 3, 2017. Published May 2017. Originally approved in 1992. Last previous edition approved in 2014 as E92-14. DOI: 10.1520/E092-17.

<sup>2</sup> 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.

<sup>3</sup>A Summary of Changes section appears at the end of this standard.

# Astm E92 Standard Test Methods For Vickers Hardness

**O García**



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