



Standard Test Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, Studs, and Nuts¹

This standard is issued under the fixed designation F2328; 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 covers procedures for measuring, classifying, and determining the presence of decarburization and carburization in the threaded section of hardened and tempered inch series steel bolts, screws, studs, nuts, and similar parts which have been heated to facilitate fabrication or to modify their mechanical properties. This test method is not intended to address products which are intentionally carburized to achieve specific results.

1.2 Two routine methods are described for measuring the limits of and determining the presence of decarburization or carburization—the optical method and the microindentation method 1. Either method is appropriate for routine examinations. The microindentation method 2 shall be considered the referee method.

1.3 For the purpose of these tests, there are four classes of hardened and tempered steel products for which specific measurements must be made with respect to their physical properties.

1.4 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

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:*²

E3 Guide for Preparation of Metallographic Specimens

E384 Test Method for Knoop and Vickers Hardness of
Materials

F1789 Terminology for F16 Mechanical Fasteners

3. Terminology

3.1 *Definitions:*

3.1.1 *carburization*—process or result of increasing the carbon content of the surface layers of the steel fastener product.

3.1.2 *decarburization*—in accordance with Terminology F1789, is a loss of carbon from the surface layer of the fastener, normally associated with heat treatment.

3.1.3 *gross decarburization*—also known as *complete decarburization*, is characterized by a sufficient carbon loss to show only clearly defined ferrite grains.

3.1.4 *partial decarburization*—characterized as a loss of carbon sufficient to cause a lighter shade of tempered martensite than that of the immediately adjacent base metal, but as being of insufficient carbon loss to show clearly defined ferrite grains.

4. Significance and Use

4.1 Decarburization and carburization are two surface conditions created, either intentionally or unintentionally, as with a pre-existing condition created during the rod rolling process, the rod/wire annealing process, or while heat treating threaded steel products. Too much of either will adversely affect the safety and performance of the threaded product. Therefore, limits have been established for three different product groups: the harder and greater the tensile strength of the product, the more susceptible to failure the product becomes if these limits are exceeded.

4.2 When testing to a particular product specification that lists the dimensions and microindentation data to be used, that data shall take precedence over the tables in this test method.

4.3 There are only two viable methods available to detect these deficiencies, either by the visual method or the microindentation method. Both methods are used for routine inspections when evaluations are conducted at a single location on the product sample.

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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.