



Standard Test Methods for Estimating the Depth of Decarburization of Steel Specimens¹

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

INTRODUCTION

These test methods may be used to estimate the average or greatest depth of decarburization in hardened or non-hardened steel products. The test methods described range from simple screening tests to more statistically rigorous test methods depending upon the needs of the investigation.

1. Scope

1.1 These test methods cover procedures for estimating the depth of decarburization of steels irrespective of the composition, matrix microstructure, or section shape. The following basic procedures may be used:

- 1.1.1 Screening methods.
- 1.1.2 Microscopical methods.
- 1.1.3 Microindentation hardness methods.
- 1.1.4 Chemical analysis methods.

1.2 In case of a dispute, the rigorous quantitative or lineal analysis method (see 7.3.5 and 7.3.6) shall be the referee method. These methods can be employed with any cross-sectional shape. The chemical analytical methods generally reveal a greater depth of decarburization than the microscopical methods but are limited to certain simple shapes and by availability of equipment. These techniques are generally reserved for research studies. The microindentation hardness method is suitable for accurate measurements of hardened structures with relatively homogeneous microstructures.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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 These test methods are under the jurisdiction of ASTM Committee E04 on Metallography and are the direct responsibility of Subcommittee E04.14 on Quantitative Metallography.

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2. Referenced Documents

2.1 ASTM Standards:²

- A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys
- E3 Guide for Preparation of Metallographic Specimens
- E7 Terminology Relating to Metallography
- E340 Test Method for Macroetching Metals and Alloys
- E350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
- E384 Test Method for Knoop and Vickers Hardness of Materials
- E407 Practice for Microetching Metals and Alloys
- E415 Test Method for Analysis of Carbon and Low-Alloy Steel by Spark Atomic Emission Spectrometry
- E1951 Guide for Calibrating Reticles and Light Microscope Magnifications

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in these test methods, see Terminology E7 and Terminology A941.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *average depth of decarburization*—the mean value of five or more measurements of the total depth of decarburization.

3.2.2 *average free-ferrite depth*—the mean value of five or more measurements of the depth of complete decarburization.

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.