



Standard Practice for Calibrating the Magnification of a Scanning Electron Microscope¹

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1. Scope

1.1 This practice covers general procedures necessary for the calibration of magnification of scanning electron microscopes. The relationship between true magnification and indicated magnification is a complicated function of operating conditions.² Therefore, this practice must be applied to each set of standard operating conditions to be used.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *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:³

E 7 Terminology Relating to Metallography

E 29 Standard Practice For Using Significant Digits in Test Data to Determine Conformance with Specifications

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E 456 Terminology Relating to Quality and Statistics

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 ISO Standard:

ISO Guide 30: 1992 Terms and Definitions Used in Connection with Reference Materials⁴

3. Terminology

3.1 Definitions:

3.1.1 For definitions of metallographic terms used in this practice see Terminology E 7.

3.1.2 The definitions related to statistical analysis of data appearing in Practice E 77, Terminology E 456, and Practice E 691 shall be considered as appropriate to the terms used in this practice.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *calibration*—the set of operations which establish, under specified conditions, the relationship between magnification values indicated by the SEM and the corresponding magnification values determined by examination of a reference material.

3.2.2 *calibration method*—a technical procedure for performing a calibration.

3.2.3 *certified reference material*—reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes its traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence (see ISO Guide 30:1992).

3.2.4 *pitch*—the separation of two similar structures, measured as the center to center or edge to edge distance.

3.2.5 *reference material*—a material or substance one or more of whose property values are sufficiently homogeneous, stable, and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials (see ISO Guide 30:1992).

3.2.6 *reference standard*—a reference material, generally of the highest metrological quality available, from which measurements are derived.

3.2.7 *traceability*—the property of a result of a measurement whereby it can be related to appropriate international/national standards through an unbroken chain of comparisons.

3.2.8 *verification*—confirmation by examination and provision of evidence that specified requirements have been met.

¹ This practice is under the jurisdiction of ASTM Committee E04 on Metallography and is the direct responsibility of Subcommittee E04.11 on X-Ray and Electron Metallography.

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² See Annex A1.

³ 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.

⁴ Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.