



Standard Practice for Determining the Impedance of Absolute Eddy-Current Probes¹

This standard is issued under the fixed designation E1629; 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 practice covers a procedure for determining the impedance of absolute eddy-current probes (bridge-type, air or ferrite core, wire wound, shielded, or unshielded) used for finding material defects in electrically conducting material. This practice is intended to establish a uniform methodology to measure the impedance of eddy-current probes prior to receipt of these probes by the purchaser or the specifier.

1.2 *Limitations*—This practice does not address the characterization or measurement of the impedance of differential, a-c coupled, or transmit/receive types of probes. This practice does not address the use of magnetic materials in examination probes. This practice shall not be used as a basis for selection of the best probe for a particular application or as a means by which to calibrate or standardize a probe for a specific examination. This practice does not address differences in the impedance values that can be obtained when the probe and material are in relative motion, as in a rotating probe, since the procedure described here requires the probe and material to be stationary.

1.3 *Units*—The values stated in SI units are to be regarded as the standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered 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.*

2. Referenced Documents

2.1 The following document forms a part of this practice to the extent specified herein:

2.2 *ASTM Standards:*

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.07 on Electromagnetic Method.

Current edition approved Nov. 1, 2012. Published November 2012. Originally approved in 1994. Last previous edition approved in 2007 as E1629 - 07. DOI: 10.1520/E1629-12.

E1316 Terminology for Nondestructive Examinations²

3. Terminology

3.1 *Definitions*—Definitions of terms relating to electromagnetic examination are given in Terminology E1316.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *eddy-current reference standard*—for the purposes of the method described in this practice, a rectangular block made of an aluminum alloy (see 6.1.2) to which an active eddy-current probe is applied. The eddy-current reference standard can also be referred to as an eddy-current test block.

3.3 *Mathematical Symbols:*

3.3.1 j —a symbol used in electrical engineering to represent $\sqrt{-1}$. It is associated with the restriction to the flow of electrical current caused by capacitors and coils.

3.3.2 N —any number.

3.3.3 $| -N |$ —the magnitude of N , regardless whether N is positive, negative, or a vector quantity.

3.3.4 $\sqrt{N}$ —the square root of N .

3.3.5 $(-N)^2$ — N squared, that is, $N \times N$.

3.3.6 ΔN —delta N , the change or difference in N .

3.4 *Abbreviations:*

3.4.1 *tan*—used for the tangent function. The $\tan^{-1}$, arc tangent or inverse tangent function, returns a value that is a measure of an angle and can be in either degrees or radians. When using a calculator to determine the $\tan^{-1}$, care should be taken to determine whether the answer is in degrees or radians since the numerical values that represent the same angle are different.

3.4.2 *cos*—used for the cosine function.

3.4.3 *sin*—used for the sine function.

4. Significance and Use

4.1 Eddy-current probes may be used for the nondestructive examination of parts or structures made of electrically conducting materials. Many of these examinations are intended to

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.