



Standard Practice for Ultrasonic Testing Using Electromagnetic Acoustic Transducer (EMAT) Techniques¹

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1. Scope*

1.1 This practice covers procedures for the use of electromagnetic acoustic transducers (EMATs) for specific ultrasonic examination applications. Recommendations are given for specific applications for using EMAT techniques to detect flaws through both surface and volumetric examinations as well as to measure thickness.

1.2 These procedures recommend technical details and guidelines for the reliable and reproducible ultrasonic detection of flaws and thickness measurements using electromagnetic acoustic transducers for both the pulsing and receiving of ultrasonic waves. The EMAT techniques described herein can be used as a basis for assessing the serviceability of various components nondestructively, as well as for process control in manufacturing.

1.3 These procedures cover noncontact techniques for coupling ultrasonic energy into materials through the use of electromagnetic fields. Surface, Lamb, longitudinal, and shear wave modes are discussed.

1.4 These procedures are intended to describe specific EMAT applications. These procedures are intended for applications in which the user has determined that the use of EMAT techniques can offer substantial benefits over conventional piezoelectric search units. It is not intended that EMAT techniques should be used in applications in which conventional techniques and applications offer superior benefits (refer to Guide E1774).

1.5 These procedures are applicable to any material in which acoustic waves can be introduced electromagnetically. This includes any material that is either electrically conductive or ferromagnetic.

1.6 The procedures outlined in this practice address proven EMAT techniques for specific applications; they do not purport to address the only variation or all variations of EMAT

techniques to address the given applications. Latitude in application techniques is offered where options are considered appropriate.

1.7 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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.*

2. Referenced Documents

2.1 ASTM Standards:²

E114 Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing

E494 Practice for Measuring Ultrasonic Velocity in Materials

E543 Specification for Agencies Performing Nondestructive Testing

E587 Practice for Ultrasonic Angle-Beam Contact Testing

E797 Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method

E1316 Terminology for Nondestructive Examinations

E1774 Guide for Electromagnetic Acoustic Transducers (EMATs)

2.2 ASNT Standards:³

SNT-TC-1A Recommended Practice for Personnel Qualifications and Certification in Nondestructive Testing

ANSI/ASNT CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel

2.3 Aerospace Industries Association Standard:

NAS 410 Certification and Qualification of Nondestructive Test Personnel⁴

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.06 on Ultrasonic Method.

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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.

³ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁴ Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.