



Standard Practice for Examination of Mill and Kiln Girth Gear Teeth— Electromagnetic Methods¹

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1. Scope*

1.1 This practice describes a two-part procedure for electromagnetic evaluation on gear teeth on mill and kiln gear drives and pinions. The first part of this practice details the ability to detect 100 % of surface-breaking discontinuities only in the addendum, dedendum, and root area on both the drive side and non-drive side of the gear tooth using an eddy current array. The second part of the examination is to size or measure accurately the length and depth of any cracks found in these areas using electromagnetic methods. No other practice addresses the use of electromagnetic methods for the detection and sizing of surface-breaking discontinuities on mill and kiln ring gear teeth.

1.2 This practice is used only for crack detection, alignment issues, wear patterns, and early signs of macro-pitting. It will not illustrate a full gear tooth analysis. Visual examination by an experienced gear technician is the only way to analyze fully gear teeth wear patterns and potential failure.

1.3 Two technicians, or one technician and a technical assistant, are typically required for this practice. One technical assistant guides the probe and the technician operates the computer/software and analyzes the gear teeth condition.

1.4 It is important that the appropriate method standards, such as Guide E709 and Practice E2261, if the alternating current field measurement approach is used for crack sizing, accompany the technician when performing the examination.

1.5 It is recommended that the technician reviews the appendixes in this practice in advance of starting the job.

1.6 A clean gear is recommended for a complete gear analysis. Depending on the lubrication used, the technician, in discussion with the client, shall determine the appropriate cleaning procedure, if cleaning is required. If an oil bath lubrication system is used, ensure the gear teeth surface is

clean. If an asphaltic-based or synthetic-based lubricant is used, refer to the annexes and appendices in this practice.

1.7 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

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

E709 Guide for Magnetic Particle Testing
E1316 Terminology for Nondestructive Examinations
E2261 Practice for Examination of Welds Using the Alternating Current Field Measurement Technique
E2884 Guide for Eddy Current Testing of Electrically Conducting Materials Using Conformable Sensor Arrays

2.2 AIA Standard:³

NAS 410 Certification and Qualification of Nondestructive Test Personnel

2.3 ANSI/AGMA Standards:⁴

AGMA 912-A04 Mechanisms of Gear Tooth Failures—Information Sheet
ANSI/AGMA 1010 E-95 Standard for Appearance of Gear Teeth—Terminology of Wear and Failure
ANSI/AGMA 1012 G-05 Gear Nomenclature, Definition of Terms

¹ This test method is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.07 on Electromagnetic 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 Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.