



Standard Practice for Electromagnetic (Eddy-Current) Examination of Ferromagnetic Cylindrical Bar Product Above the Curie Temperature¹

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1. Scope

1.1 This practice covers procedures for eddy-current examination of hot ferromagnetic bars above the Curie temperature where the product is essentially nonmagnetic, but below 2100°F (1149°C).

1.2 This practice is intended for use on bar products having diameters of ½ in. (12.7 mm) to 8 in. (203 mm) at linear throughput speeds up to 1200 FPM (366 MPM). Larger or smaller diameters may be examined by agreement between the using parties.

1.3 The purpose of this document is to provide a procedure for in-line eddy-current inspection of bars during processing for the detection of major or gross surface discontinuities.

1.3.1 The types of discontinuities capable of being detected are commonly referred to as: slivers, laps, seams, roll-ins (scale, dross, etc.), and mechanical damage such as scratches, scores, or indentations.

1.4 This practice does not establish acceptance criteria. They must be specified by agreement between the using parties.

1.5 *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:

E 543 Practice for Evaluating Agencies that Perform Non-destructive Testing²

E 1316 Terminology for Nondestructive Examinations²

2.2 Other Documents:

SNT-TC-1A Recommended Practice for Personnel Qualifi-

cation and Certification in Nondestructive Testing³
ANSI/ASNT-CP-189 Standard for Qualification and Certification of NDT Personnel³

2.3 AIA Standard:

NAS 410 Certification and Qualification of Nondestructive Testing Personnel⁴

3. Terminology

3.1 *Definitions*—Terminology E 1316 shall apply to the terms used in this practice.

4. Summary of Practice

4.1 *Principle*—The major advantage of examining ferromagnetic bar product above the Curie temperature with eddy currents is the enhanced signal-to-noise ratio obtained without the need for magnetic saturation.

4.2 *Sensors*—This examination may be performed with various types or designs of encircling coils or with probe coils that are fixed or rotating.

4.2.1 One or more exciter or sensor coils is used to encircle the bar through which the product to be examined is passed. When the hot bar is in close proximity to the sensing and exciting coils, eddy currents are induced in the hot product by an alternating current. The sensing coil detects the electromagnetic flux related to these currents. Changes or disruptions in the normal flux pattern indicate the presence of discontinuities. This technique is capable of examining the entire circumference without contacting the product.

4.2.2 The surface can also be examined with probe coils having one or more exciters and sensors which are spaced in close proximity to the product surface. The probe is usually small and does not encircle the product, making it necessary to rotate either the probes or the product to obtain 100 % coverage of the circumference. This is essentially a contact technique because the coil is fixtured in a device that rides on the circumference to maintain a fixed distance between the coil and product surface.

¹ This practice is under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing and is the direct responsibility of Subcommittee E7.07 on Electromagnetic Method.

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² *Annual Book of ASTM Standards*, Vol 03.03.

³ Available from American Society for Nondestructive Testing, 1711 Arlinggate Plaza, P.O. Box 28518, Columbus, OH 43228-0518.

⁴ Available from the Aerospace Industries Association of America, Inc., 1250 Eye Street, N.W., Washington, DC 20005.