



Designation: E 1033 – 98

# Standard Practice for Electromagnetic (Eddy-Current) Examination of Type F-Continuously Welded (CW) Ferromagnetic Pipe and Tubing Above the Curie Temperature<sup>1</sup>

This standard is issued under the fixed designation E 1033; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice covers a procedure for in-line, eddy-current examination of continuously welded (CW) ferromagnetic pipe and tubing at temperatures above the Curie temperature (approximately 1400°F (760°C), where the pipe is substantially nonmagnetic or austenitic.

1.2 This practice is intended for use on tubular products having nominal diameters of ½ in. (12.7 mm) to 4 in. (101.6 mm). These techniques may be used for larger- or smaller-diameter pipe and tubing as specified by the using parties.

1.3 This practice is specifically applicable to eddy-current examination using encircling coils, or probe coils.

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

1.5 The values stated in inch-pound units are to be regarded as standard. The SI units in parentheses may be approximate.

1.6 *This standard does not purport to address the safety problems 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 309 Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation<sup>2</sup>

E 543 Practice for Agencies Performing Nondestructive Testing<sup>2</sup>

E 1316 Terminology for Nondestructive Examinations<sup>2</sup>

### 2.2 Other Documents:

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing<sup>3</sup>

ANSI/ASNT-CP-189 ASNT Standard for Qualification and

Certification of Nondestructive Testing Personnel<sup>3</sup>  
MIL-STD-410E Nondestructive Testing Personnel Qualification and Certification<sup>4</sup>  
NAS-410 NAS Certification and Qualification of Nondestructive Personnel (Quality Assurance Committee)<sup>5</sup>

## 3. Terminology

3.1 Standard terminology relating to electromagnetic examination may be found in Terminology E 1316, Section C, Electromagnetic Testing.

## 4. Summary of Practice

4.1 In-line, automatic, eddy-current examination of CW pipe utilizes probes or encircling coils, or both, mounted in the pass line to monitor the quality of pipe during production at temperatures ranging from 1600 to 2200°F (870 to 1204°C).

4.2 Eddy-current instrumentation provides timely and useful information regarding the acceptability of CW pipe for quality control purposes as well as for early warning that unacceptable pipe is being produced.

## 5. Significance and Use

5.1 The purpose of this practice is to outline a procedure for the in-line eddy-current examination of hot CW pipe for the detection of major imperfections and repetitive discontinuities.

5.2 A major advantage of in-line eddy-current examination of ferromagnetic CW pipe above the Curie temperature lies in the enhanced signal-to-noise ratio and depth of penetration obtained without the use of magnetic saturation.

5.3 The eddy-current method is capable of detecting and locating weld imperfections commonly referred to as open welds, cave welds, black spots (weld inclusions), and partial welds (incomplete penetration). In addition, it will detect pipe-wall imperfections such as slivers, laps, and ring welds (end welds).

5.4 The relative severity of the imperfections may be indicated by eddy-current signal amplitude or phase, or both.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.07 on Electromagnetic Methods.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 03.03.

<sup>3</sup> Available from American Society for Nondestructive Testing, 1711 Arlingate Plaza, PO Box 28518, Columbus, OH 43228-0518.

<sup>4</sup> Available from Standardization Documents Order Desk, Bldg. 4, Section D, 100 Robbins Ave., Philadelphia, PA 19111-5904.

<sup>5</sup> Available from Aerospace Industries Association of America, Inc., 1250 Eye Street, N.W., Washington, DC 20005.