



Designation: E 703 – 98

Standard Practice for Electromagnetic (Eddy-Current) Sorting of Nonferrous Metals¹

This standard is issued under the fixed designation E 703; 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 describes a procedure for sorting nonferrous metals using the electromagnetic (eddy-current) method. The procedure is intended for use with instruments using absolute or comparator-type coils for distinguishing variations in mass, shape, conductivity, and other variables such as alloy, heat treatment, or hardness that may be closely correlated with the electrical properties of the material. Selection of samples to evaluate sorting feasibility and to establish calibration standards is also described.

1.2 *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 105 Practice for Probability Sampling of Materials²

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process²

E 1316 Terminology for Nondestructive Examinations³

3. Terminology Definitions

3.1 Definitions of terms relating to electromagnetic testing are given in Terminology E 1316.

4. Summary of Practice

4.1 The techniques that are primarily used in electromagnetic sorting employ the absolute (single-) and comparative (two-) coil methods using either encircling or probe coils. The decision of whether to use single-coil or two-coil operation is usually based on empirical data. In the absolute-coil method (encircling or probe), the equipment is calibrated by placing standards of known properties in the test coil. The value of the tested electrical parameter, which may be correlated with alloy,

heat treatment temper, or hardness, is read on the display of an indicator. In the comparative coil method (encircling or probe coils), the test specimen in one coil is compared with a reference piece in a second coil to determine whether the test specimen is within or outside of the required limits.

4.1.1 Absolute Coil Method:

4.1.1.1 *Encircling Coil*—Samples of known classification (standards) are inserted consecutively in the test coil, and the controls of the instrument are adjusted to obtain appropriate response. Typically, three samples would be used representing the upper, lower, and mid-range for which calibration is required. The test is then conducted by inserting the specimens to be sorted into the test coil, and observing the instrument response.

4.1.1.2 *Probe Coil*—The probe coil is placed consecutively on the standards of known properties and the controls of the instrument are adjusted for appropriate response (see 4.1.1.1). The test is then conducted by placing the probe on the specimens to be sorted and observing the instrument response.

4.1.2 Comparative Coil Method:

4.1.2.1 *Encircling Coil*—Known reference pieces (standards) representing the minimum or maximum limits, or both, of acceptance or sorting category are inserted in the reference and test coil. The instrument controls are adjusted for appropriate responses. The test is then conducted by inserting specimens to be sorted in the test coil, leaving the known reference in the reference coil and observing the instrument response.

4.1.2.2 *Probe Coil*—Both probe coils are placed on the reference pieces (standard) representing the minimum or maximum limits, or both, of acceptance or sorting category. The instrument controls are adjusted for appropriate responses. The test is then conducted by placing the test probe on the specimens to be sorted (the other probe is left on the reference standard) and observing the instrument response.

4.2 The range of instrument response must be so adjusted in the initial step that the anticipated deviations will be within the range of readout.

4.3 Both absolute and comparative methods using encircling coil(s) require comparing the specimens to be tested with the reference piece(s). Two or more samples representing the limits of acceptance may be required. In the absolute method,

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 Methods.

Current edition approved May 10, 1998. Published July 1998. Originally published as E 703–79. Last previous edition E 703–79 (92) ϵ 1.

² *Annual Book of ASTM Standards*, Vol 14.02.

³ *Annual Book of ASTM Standards*, Vol 03.03.