



Designation: E709 – 21

Standard Guide for Magnetic Particle Testing¹

This standard is issued under the fixed designation E709; 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 guide² covers techniques for both dry and wet magnetic particle testing, a nondestructive method for detecting cracks and other discontinuities at or near the surface in ferromagnetic materials. Magnetic particle testing may be applied to raw material, semifinished material (billets, blooms, castings, and forgings), finished material and welds, regardless of heat treatment or lack thereof. It is useful for preventive maintenance testing.

1.1.1 This guide is intended as a reference to aid in the preparation of specifications/standards, procedures and techniques.

1.2 This guide is also a reference that may be used as follows:

1.2.1 To establish a means by which magnetic particle testing, procedures recommended or required by individual organizations, can be reviewed to evaluate their applicability and completeness.

1.2.2 To aid in the organization of the facilities and personnel concerned in magnetic particle testing.

1.2.3 To aid in the preparation of procedures dealing with the examination of materials and parts. This guide describes magnetic particle testing techniques that are recommended for a great variety of sizes and shapes of ferromagnetic materials and widely varying examination requirements. Since there are many acceptable differences in both procedure and technique, the explicit requirements should be covered by a written procedure (see Section 21).

1.3 This guide does not indicate, suggest, or specify acceptance standards for parts/pieces examined by these techniques. It should be pointed out, however, that after indications have been produced, they must be interpreted or classified and then evaluated. For this purpose there should be a separate code, specification, or a specific agreement to define the type, size, location, degree of alignment and spacing, area concentration,

and orientation of indications that are unacceptable in a specific part versus those which need not be removed before part acceptance. Conditions where rework or repair is not permitted should be specified.

1.4 This guide describes the use of the following magnetic particle method techniques.

1.4.1 Dry magnetic powder (see 8.4).

1.4.2 Wet magnetic particle (see 8.5).

1.4.3 Magnetic slurry/paint magnetic particle (see 8.5.7), and

1.4.4 Polymer magnetic particle (see 8.5.8).

1.5 *Personnel Qualification*—Personnel performing examinations in accordance with this guide should be qualified and certified in accordance with ASNT Recommended Practice No. SNT-TC-1A, ANSI/ASNT Standard CP-189, NAS 410, or as specified in the contract or purchase order.

1.6 *Nondestructive Testing Agency*—If a nondestructive testing agency as described in Specification E543 is used to perform the examination, the nondestructive testing agency should meet the requirements of Specification E543.

1.7 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.8 **Warning**—Mercury has been designated by many regulatory agencies as a hazardous material that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Safety Data Sheet (SDS) for additional information. Users should be aware that selling mercury or mercury containing products, or both, into your state or country may be prohibited by law.

1.9 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

¹ This guide is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.03 on Liquid Penetrant and Magnetic Particle Methods.

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² For ASME Boiler and Pressure Vessel Code Applications, see related Guide S2-709 in Section II of that Code.

*A Summary of Changes section appears at the end of this standard.

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Magnetic Particle Inspection M.J. Lovejoy,1993-06-30 During the years since this book was first published in 1993 there have very few developments in the technology of magnetic particle inspection apart from improvements in instrumentation which has made the measurement of peak values of time varying currents practicable The major changes have arisen from health and safety and environmental concerns These involve chemicals and exposure of personnel to air borne electromagnetic fields and long wave ultraviolet UY A The changes in the acceptability of certain volatile halogenated hydrocarbons which led to the banning of 1,1,1 trichloroethane in 1995 were evident in 1993 The present discussions concerning the emissions of volatile organic compounds VOCs in general was also current and has now reached a stage where the effects of these deliberations will become evident over the next few years Concerns over the exposure of personnel to airborne electromagnetic fields has been current for some years as has discussions to the effects of long wave ultraviolet UY A on human skin Recommendations as to maximum permitted exposures over periods of time to both of these phenomena have been put forward and will doubtless form the basis of future legislation on the matter A number of new specifications have appeared notably EN European and ISO specifications and some of these are still in preparation Generally their impact will be minimal since these specifications are largely derived from existing documentation

Magnetic Particle Inspection M.J. Lovejoy,2012-12-06 During the years since this book was first published in 1993 there have very few developments in the technology of magnetic particle inspection apart from improvements in instrumentation which has made the measurement of peak values of time varying currents practicable The major changes have arisen from health and safety and environmental concerns These involve chemicals and exposure of personnel to air borne electromagnetic fields and long wave ultraviolet UY A The changes in the acceptability of certain volatile halogenated hydrocarbons which led to the banning of 1,1,1 trichloroethane in 1995 were evident in 1993 The present discussions concerning the emissions of volatile organic compounds VOCs in general was also current and has now reached a stage where the effects of these deliberations will become evident over the next few years Concerns over the exposure of personnel to airborne electromagnetic fields has been current for some years as has discussions to the effects of

long wave ultraviolet UVA on human skin Recommendations as to maximum permitted exposures over periods of time to both of these phenomena have been put forward and will doubtless form the basis of future legislation on the matter A number of new specifications have appeared notably EN European and ISO specifications and some of these are still in preparation Generally their impact will be minimal since these specifications are largely derived from existing documentation

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