



Designation: A904 – 09

Standard Specification for 50 Nickel-50 Iron Powder Metallurgy Soft Magnetic Parts¹

This standard is issued under the fixed designation A904; 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 specification covers the magnetic properties of 50 nickel-50 iron parts fabricated by powder metallurgy techniques and is intended for parts that require high magnetic permeability, high electrical resistivity, low coercive field strength, and low hysteresis loss. It differs from the wrought alloy specification (see Specification [A753](#)) because these parts are porous. A number of magnetic properties such as permeability are proportional to the sintered density.

1.2 This specification deals with powder metallurgy parts in the sintered or annealed condition. Should the sintered parts be subjected to any secondary operation that causes mechanical strain, such as machining or sizing, they should be resintered or annealed.

1.3 The values stated in customary (cgs-emu and inch-pound) units are to be regarded separately as standard. The values given in parentheses are mathematical conversions to SI units, which are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

[A34/A34M Practice for Sampling and Procurement Testing of Magnetic Materials](#)

[A340 Terminology of Symbols and Definitions Relating to Magnetic Testing](#)

[A596/A596M Test Method for Direct-Current Magnetic Properties of Materials Using the Ballistic Method and Ring Specimens](#)

[A753 Specification for Wrought Nickel-Iron Soft Magnetic Alloys \(UNS K94490, K94840, N14076, N14080\)](#)

[A773/A773M Test Method for dc Magnetic Properties of Materials Using Ring and Permeameter Procedures with](#)

[dc Electronic Hysteresigraphs](#)

[B328 Test Method for Density, Oil Content, and Interconnected Porosity of Sintered Metal Structural Parts and Oil-Impregnated Bearings \(Withdrawn 2009\)](#)³

[B962 Test Methods for Density of Compacted or Sintered Powder Metallurgy \(PM\) Products Using Archimedes' Principle](#)

[E1019 Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques](#)

3. Terminology

3.1 The terms and symbols used in this specification are defined in Terminology [A340](#).

4. Ordering Information

4.1 Orders for parts conforming to this specification shall include the following information.

4.1.1 Reference to this standard and year of issue/revision.

4.1.2 Reference to an applicable part drawing.

4.1.3 Quantity required.

4.1.4 A critical cross section of the part shall be defined and so indicated on the applicable part drawing. The location of the critical section is by mutual agreement between the user and producer (see [6.2](#)).

4.1.5 Magnetic property requirements if they are other than stated in [7.5](#).

4.1.6 Certification of chemical composition or magnetic property evaluation, or both (Sections [5](#) and [7](#)).

4.1.7 Marking and packaging requirements (Section [12](#)).

4.1.8 Exceptions to this specification or special requirements such as functional testing as mutually agreed upon by the producer and user.

5. Chemical Composition

5.1 The chemical composition of the parts shall conform to the requirements prescribed in [Table 1](#).

5.2 Determination of metallic constituents shall be by a method acceptable to both producer and user. Analysis of

¹ This specification is under the jurisdiction of ASTM Committee [A06](#) on Magnetic Properties and is the direct responsibility of Subcommittee [A06.02](#) on Material Specifications.

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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 The last approved version of this historical standard is referenced on www.astm.org.