



Standard Specification for Iron-Phosphorus Powder Metallurgy (P/M) Parts for Soft Magnetic Applications¹

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1. Scope

1.1 This specification covers parts produced from iron-phosphorus powder metallurgy materials. These parts are used in magnetic applications requiring higher permeability and electrical resistivity and lower coercive field strength than attainable routinely from parts produced from iron powder.

1.2 Two powder types are covered; Type I containing nominally 0.45 % phosphorus, and Type II containing nominally 0.8 % phosphorus.

1.3 This specification deals with P/M 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.

1.4 The values stated in customary (cgs-emu and inch-pound) units are to be regarded 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:

A 34/A 34M Practice for Procurement, Testing and Sampling of Magnetic Materials²

A 596/A 596M Test Method for Direct Current Magnetic Properties of Materials Using the Ballistic Method and Ring Specimens²

A 773/A 773M Test Method for dc Magnetic Properties of Materials Using Ring and Permeameter Procedures with dc Electronic Hysteresigraphs²

B 328 Test Method for Density, Oil Content, and Interconnected Porosity of Sintered Powder Metal Structural Parts and Oil-Impregnated Bearings³

E 1019 Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys⁴

3. Ordering Information

3.1 Purchase orders for parts conforming to this specification shall include the following information:

3.1.1 Reference to this specification and year of issue/revision.

3.1.2 The type of powder to be used (see 4.1 and Table 1).

3.1.3 Reference to an applicable part drawing.

3.1.4 Quantity required.

3.1.5 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 the producer (see 5.2).

3.1.6 Magnetic property requirements if they are other than stated in Table 2.

3.1.7 Whether certification of chemical analysis or magnetic property evaluation is required (see Sections 4 and 6).

3.1.8 Marking and packaging requirements (see Section 11).

3.1.9 Whether testing for magnetic aging is required.

3.1.10 Exceptions to this specification or special requirements such as functional testing, as mutually agreed upon between the producer and the user.

4. Chemical Composition

4.1 The chemical composition of the parts shall conform to the requirements prescribed in Table 1.

4.2 Chemical analysis for phosphorus shall be determined by wet chemistry in accordance with a method to be agreed upon between the user and the producer. Analysis of carbon, oxygen, and nitrogen shall be done in accordance with Test Methods E 1019.

5. Sintered Density Requirements

5.1 Magnetic and residual induction of P/M parts strongly depend on density. The density of P/M parts is determined by the compressibility of the powder, the compacting pressure, and sintering practice (temperature, time, and atmosphere).

¹ This specification is under the jurisdiction of ASTM Committee A06 on Magnetic Properties and is the direct responsibility of Subcommittee A06.02 on Materials Specifications.

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² *Annual Book of ASTM Standards*, Vol 03.04.

³ *Annual Book of ASTM Standards*, Vol 02.05.

⁴ *Annual Book of ASTM Standards*, Vol 03.05.