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Standard Specification for Powder Forged (P/F) Ferrous Structural Parts¹

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1. Scope

1.1 This specification covers powder forged ferrous materials fabricated by hot densification of atomized prealloyed or iron powders and intended for use as structural parts.

1.2 This specification covers powder forged parts made from the following materials:

1.2.1 Compositions:

1.2.1.1 P/F-10XX Carbon Steel (produced from atomized iron powder and graphite powder),

1.2.1.2 P/F-10CXX Copper-Carbon Steel (produced from atomized iron powder, copper and graphite powders),

1.2.1.3 P/F-11XX Carbon Steel with manganese sulfide for enhanced machinability (produced from atomized iron powder, manganese sulfide, and graphite powders),

1.2.1.4 P/F-11CXX Copper-Carbon Steel with manganese sulfide for enhanced machinability (produced from atomized iron powder, copper, manganese sulfide, and graphite powders),

1.2.1.5 P/F-42XX Nickel-Molybdenum Steel (produced from prealloyed atomized iron-nickel-molybdenum powder and graphite powder),

1.2.1.6 P/F-46XX Nickel-Molybdenum Steel (produced from prealloyed atomized iron-nickel-molybdenum powder and graphite powder),

1.2.1.7 P/F-44XX Molybdenum Steel (produced from prealloyed atomized iron-molybdenum powder and graphite powder), and

1.2.1.8 P/F-49XX Molybdenum Steel (produced from prealloyed atomized iron-molybdenum powder and graphite powder).

NOTE 1—Alloy composition designations are modifications of the AISI-SAE nomenclature. For example: 10CXX designates a plain carbon steel containing copper and XX amount of carbon. Compositional limits of alloy and impurity elements may be different from the AISI-SAE limits. Chemical composition limits are specified in Section 6.

NOTE 2—XX designates the forged carbon content, in hundredths of a percent, that is specified by the purchaser for the application. For a given specified carbon content, the permissible limits shall be as specified in 6.2.

1.2.2 Grades:

1.2.2.1 Grade A—Density equivalent to a maximum of

0.5 % porosity. The minimum density of those sections of the powder forged part so designated by the applicable part drawing shall not be less than the value specified in Table 1.

1.2.2.2 Grade B—Density equivalent to a maximum of 1.5 % porosity. The minimum density of those sections of the powder forged part so designated by the applicable part drawing shall not be less than the value specified in Table 1.

1.3 Property values stated in inch-pound units are the standard. Conversion factors to SI units may be approximate.

2. Referenced Documents

2.1 ASTM Standards:

B 243 Terminology of Powder Metallurgy²

B 311 Test Method for Density Determination for Powder Metallurgy (P/M) Materials Containing Less Than Two Percent Porosity²

B 795 Test Method for Determining the Percentage of Alloyed or Unalloyed Iron Contamination Present in Low-Alloy Powder Forged (P/F) Steel Parts²

B 796 Test Method for Nonmetallic Inclusion Level of Low-Alloy Powder Forged (P/F) Steel Parts²

B 797 Test Methods for Surface Finger Oxide Penetration Depth and Presence of Interparticle Oxide Networks in Low-Alloy Powder Forged (P/F) Steel Parts²

E 3 Methods of Preparation of Metallographic Specimens³

E 8 Test Methods for Tension Testing of Metallic Materials³

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials³

E 23 Test Methods for Notched Bar Impact Testing of Metallic Materials³

E 350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron⁴

E 415 Test Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel⁵

E 562 Practice for Determining Volume Fraction by Systematic Manual Point Count³

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

¹ This specification is under the jurisdiction of ASTM Committee B-9 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.11 on Near Full Density Powder Metallurgy Materials.

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² Annual Book of ASTM Standards, Vol 02.05.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Annual Book of ASTM Standards, Vol 03.05.

⁵ Annual Book of ASTM Standards, Vol 03.06.