



Standard Specification for Materials for Nonferrous Powder Metallurgy (P/M) Structural Parts¹

This standard is issued under the fixed designation B 823; 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 a variety of nonferrous powder metallurgy (P/M) structural materials and includes a classification system, or material designation code. With the classification system, this specification includes chemical composition and minimum tensile yield strength.

1.2 The property values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

NOTE 1—Paragraphs 6.1 and 8.1 govern material classification by the designation code. The classification system is explained in the Appendix.

2. Referenced Documents

2.1 ASTM Standards:

B 243 Terminology of Powder Metallurgy²

B 328 Test Method for Density, Oil Content, and Interconnected Porosity of Sintered Powder Metal Structural Parts and Oil-Impregnated Bearings²

2.2 Other Standard:

MPIF Standard 35, Materials Standard for P/M Structural Parts³

3. Terminology

3.1 *Definitions*—Definitions of powder metallurgy terms can be found in Terminology B 243. Additional descriptive information is available in the Related Materials section of Vol 02.05 of the *Annual Book of ASTM Standards*.

4. Ordering Information

4.1 Materials for parts covered by this specification shall be ordered by materials designation code.

4.2 Orders for parts under this specification may include the following information:

4.2.1 Certification, if required (see Section 10),

4.2.2 Test methods and mechanical properties other than strength (see 8.2 and 8.3),

4.2.3 Density (see 7.1),

4.2.4 Porosity and oil content (see 7.2), and

4.2.5 Special packaging, if required.

5. Materials and Manufacture

5.1 Structural parts shall be made by pressing and sintering metal powders. Parts may also be made by repressing and resintering sintered parts, if necessary, to produce finished parts in conformance with the requirements of this specification.

6. Chemical Composition

6.1 The material shall conform to the requirements provided in Table 1.

6.2 Chemical analysis, if required, shall be performed by any method agreed upon by the manufacturer and the purchaser.

7. Physical Properties

7.1 Density:

7.1.1 The buyer and the seller may agree upon a minimum average density for the part and minimum densities for specific regions of the part.

7.1.2 Density shall be determined in accordance with Test Method B 328.

7.2 Porosity:

7.2.1 The buyer and the seller may agree upon a minimum volume oil content for parts that are to be self-lubricating.

7.2.2 The buyer and the seller may agree upon a functional test for porosity in parts that are to be self-lubricating, or for permeability where fluid flow must be restricted.

8. Mechanical Properties

8.1 The minimum guaranteed tensile yield strength, as shown in Table 2, is a numerical suffix to the material designation code and is read as 10^3 psi. The code is adopted from MPIF Standard 35. All tensile yield strengths are defined as the 0.2 % offset yield strengths.

8.2 The purchaser and manufacturer should agree upon the method to be used to verify the minimum strength characteristics of the finished parts. Since it is usually impossible to machine tensile test specimens from these parts, alternative strength tests are advisable. An example would be measuring the force needed to break teeth off a gear with the gear properly fixtured.

¹ This test method is under the jurisdiction of ASTM Committee B-9 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.05 on Structural Parts.

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² *Annual Book of ASTM Standards*, Vol 02.05.

³ Available from Metal Powder Industries Federation, 105 College Road East, Princeton, NJ 08540.

TABLE 1 Chemical Requirements

| Material Designation | Chemical Composition, % ^A | | | | | |
|----------------------|--------------------------------------|-----------|-----|------|------|-----|
| | Cu | Zn | Pb | Sn | Ni | |
| CZ-1000 | 88.0 | remainder | ... | ... | ... | min |
| | 91.0 | remainder | ... | ... | ... | max |
| CZP-1002 | 88.0 | remainder | 1.0 | ... | ... | min |
| | 91.0 | remainder | 2.0 | ... | ... | max |
| CZP-2002 | 77.0 | remainder | 1.0 | ... | ... | min |
| | 80.0 | remainder | 2.0 | ... | ... | max |
| CZ-3000 | 68.5 | remainder | ... | ... | ... | min |
| | 71.5 | remainder | ... | ... | ... | max |
| CZP-3002 | 68.5 | remainder | 1.0 | ... | ... | min |
| | 71.5 | remainder | 2.0 | ... | ... | max |
| CNZ-1818 | 62.5 | remainder | ... | ... | 16.5 | min |
| | 65.5 | remainder | ... | ... | 19.5 | max |
| CNZP-1816 | 62.5 | remainder | 1.0 | ... | 16.5 | min |
| | 65.5 | remainder | 2.0 | ... | 19.5 | max |
| CT-1000 | 87.5 | remainder | ... | 9.5 | ... | min |
| | 90.5 | remainder | ... | 10.5 | ... | max |

^A Other elements: the total by difference equals 2.0 % maximum, which may include other minor elements added for specific purposes.

TABLE 2 Minimum Yield Strength for Nonferrous Alloys

| Material Designation Code | Minimum Yield Strength, 10 ³ psi |
|---------------------------|---|
| CZ-1000-9 | 9 |
| -10 | 10 |
| -11 | 11 |
| CZP-1002-7 | 7 |
| CZP-2002-11 | 11 |
| -12 | 12 |
| CZ-3000-14 | 14 |
| -16 | 16 |
| CZP-3002-13 | 13 |
| -14 | 14 |
| CNZ-1818-17 | 17 |
| CNZP-1816-13 | 13 |
| CT-1000-13 (repressed) | 13 |

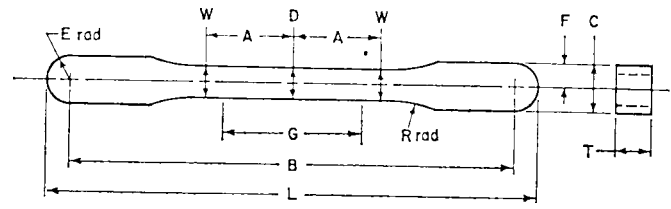
8.3 The tensile yield strength of the part may be measured indirectly by testing flat tensile bars (See Fig. 1) molded from the same mixed powder lot at the density of the critical region of the parts and then processed along with the parts.

8.4 Transverse rupture strength values can also be related to tensile yield strengths by correlation. While nonferrous P/M materials are technically too ductile for this simple beam test, the test values are reproducible and useful.

9. Sampling

9.1 Lot—Unless otherwise specified, a lot shall consist of parts of the same form and dimensions made from powders of the same composition, molded and processed under the same conditions, and submitted for inspection at one time.

9.2 Chemical Analysis—When requested on the purchase



Pressing Area = 1.00 in.²

Note—Dimensions specified, except G and T are those of the die.

| Dimensions | in. | | mm | |
|-----------------------------------|----------------|--|--------------|--|
| | | | | |
| A—Half length of reduced section | 5/8 | | 15.88 | |
| B—Grip length | 3.187 ± 0.001 | | 80.95 ± 0.03 | |
| C—Width of grip section | 0.343 ± 0.001 | | 8.71 ± 0.03 | |
| D—Width at center | 0.225 ± 0.001 | | 5.72 ± 0.03 | |
| E—End radius | 0.171 ± 0.001 | | 4.34 ± 0.03 | |
| F—Half width of grip section | 0.171 ± 0.001 | | 4.34 ± 0.03 | |
| G—Gage length | 1.000 ± 0.003 | | 25.40 ± 0.08 | |
| L—Overall length | 3.529 ± 0.001 | | 89.64 ± 0.03 | |
| R—Radius of fillet | 1 | | 25.4 | |
| T—Compact to this thickness | 0.140 to 0.250 | | 3.56 to 6.35 | |
| W—Width at end of reduced section | 0.235 ± 0.001 | | 5.97 ± 0.03 | |

FIG. 1 Standard Flat Unmachined Tension Test Specimen for Powder Metallurgy Products

order, at least one sample for chemical analysis shall be taken from each lot. The analysis shall be performed by a mutually agreed upon method.

9.3 Mechanical Tests—The manufacturer and the purchaser shall agree upon a representative number of specimens for mechanical tests.

10. Rejection and Rehearing

10.1 Parts failing to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing.

11. Certification

11.1 When specified in the purchase order or contract, a certification from the producer shall be furnished to the purchaser which states that the parts were manufactured, sampled, tested, and inspected in accordance with this specification and have been found to meet its requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

12. Keywords

12.1 brass; bronze; nickel silver; nonferrous powder metallurgy; nonferrous structural parts; powder metallurgy (P/M); structural parts