



Designation: B 438/B 438M – 00

Standard Specification for Sintered Bronze Bearings (Oil-Impregnated)¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers sintered bronze, oil-impregnated bearings made primarily from elemental copper, tin, and graphite powders. The manufacturer may, at his discretion, use prealloyed bronze powder in the blend.

1.2 This specification covers the following variables:

1.2.1 *Grades*—Available in three bronze base composition grades identifiable by different graphite contents.

1.2.2 *Type*—Grades 1 and 2 are available in four types described by specific density ranges.

1.3 Bearings ordered to this specification will normally be sized after sintering and will be impregnated with a lubricating oil unless otherwise specified by print.

1.4 The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards*:

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

E 9 Test Methods of Compression Testing of Metallic Materials at Room Temperature³

Volume 03.05 *Annual Book of ASTM Standards*

3. Ordering Information

3.1 Orders for parts under this specification shall include the following information:

3.1.1 Dimensions and tolerances (Section 9),

3.1.2 Grade and class (Table 1),

3.1.3 Density specification (Table 2 and Table 3), and

3.1.4 Oil type.

TABLE 1 Chemical Requirements (Composition, %)

Element	Grade 1	Grade 2	Grade 3
Copper	87.2–90.5	85.7–90.0	82.8–88.3
Tin	9.5–10.5	9.5–10.5	9.2–10.2
Graphite	0–0.3	0.5–1.8	2.5–5.0
Iron, max	1.0	1.0	1.0
Total other elements by difference, max	1.0	1.0	1.0

4. Materials and Manufacture

4.1 Sintered bronze bearings shall be made by molding or briquetting metal powder mixtures to the proper density. The green bearing shall be sintered at a time–temperature relationship to produce a microstructure that is essentially alpha bronze and contains no tin rich phases visible at 300×. Sintered bronze bearings are normally sized after sintering to maintain the dimensional characteristics required of the bearing. After sizing and inspection they are impregnated with a lubricating oil unless otherwise specified.

5. Chemical Composition

5.1 The material shall conform to the requirements as to the chemical composition prescribed in Table 1.

6. Physical Properties

6.1 *Density*—The density of bearings supplied impregnated with lubricant shall be within the limits prescribed in Table 2 and Table 3, when determined in accordance with Test Method B 328.

TABLE 2 Density Requirements (Oil-Impregnated)

	Type	Density g/cm ³
Grades 1 and 2	1	5.8–6.2 ^A
	2	6.4–6.8
	3	6.8–7.2
	4	7.2–7.6

^A Maximum density limit of 6.2 g/cm³ has been established on Type 1 to ensure meeting an oil content of 27 % minimum. Satisfactory bearings can also be produced between Type 1 and Type 2. These bearings have slightly higher strength constants and slightly lower oil content.

TABLE 3 Density Requirements (Oil-Impregnated)

	Type	Density, g/cm ³
Grade 3	1	5.8–6.2
	2	6.2–6.6

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 B09.04 on Bearings.

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

³ *Annual Book of ASTM Standards*, Vol 03.01.