



Designation: B 439 – 00<sup>e1</sup>

## Standard Specification for Iron-Base Sintered Bearings (Oil-Impregnated)<sup>1</sup>

This standard is issued under the fixed designation B 439; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

<sup>e1</sup> NOTE—Section 9.2 was editorially corrected in May 2003.

### 1. Scope

1.1 This specification covers sintered metal powder, oil-impregnated, bearings of four iron-base compositional grades:

Grades 1 and 2—iron-carbon

Grades 3 and 4—iron-copper

1.2 The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units may be approximate.

### 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 Bearings<sup>2</sup>

**E 9** Test Methods of Compression Testing of Metallic Materials at Room Temperature<sup>3</sup>

### 3. Ordering Information

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

3.1.1 Grade (Section 5),

3.1.2 Density (6.1),

3.1.3 Dimensions, and

3.1.4 Certification (12.1).

### 4. Manufacture

4.1 Bearings shall be made by briquetting and sintering metal powders, with or without sizing, so as to produce finished parts conforming to the requirements of this specification.

### 5. Chemical Requirements

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 fully impregnated with lubricant shall be within the limits prescribed in Table 2.

6.2 *Oil Content*—Oil content of bearings shall not be less than that shown in Table 2.

6.3 *Radial Crushing Strength*—Radial crushing strength shall not be less than the value calculated as follows:

$$P = KLT^2/(D - T) \quad (1)$$

where:

$P$  = radial crushing strength, lbf (or N);

$D$  = outside diameter of bearing, in. (or mm);

$T$  = wall thickness of bearing, in. (or mm);

$K$  = strength constant as shown in Table 3 for grade specified, psi (MPa); and

$L$  = length of bearing, in. (or mm).

### 7. Workmanship, Finish, and Appearance

7.1 Bearings shall be uniform in composition. When cut or fractured, the exposed surface shall be of uniform appearance. The parts shall be free from defects which would affect their serviceability.

### 8. Sampling

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

8.2 *Sample for Chemical Analysis*—At least one sample for chemical analysis shall be taken from each lot. A representative sample of chips may be obtained by milling, drilling, or crushing at least two pieces with clean dry tools without

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.04 on Bearings.

Current edition approved October 10, 2000. Published December 2000. Originally published as B 439–66 T to replace portions of B 202. Last previous edition B 439–95 (2000).

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.01.

**TABLE 1 Chemical Requirements**

Element	Composition, %			
	Grade 1	Grade 2	Grade 3	Grade 4
Copper	0–1.5	0–1.5	9.0–11.0	18.0–22.0
Iron	balance	balance	balance	balance
Total other elements by difference, max	2.0	2.0	2.0	2.0
Combined carbon <sup>A</sup> (on basis of iron only)	0.3 max	0.3–0.6	0.3 max	0.3 max

<sup>A</sup>The combined carbon may be a metallographic estimate of the carbon in the iron.

**TABLE 2 Density and Oil Content Requirements**

Grade	Density, g/cm <sup>3</sup>		Oil Content, Volume, % min
	min	max	
1 and 2	5.6	6.0	21
3 and 4	5.8	6.2	19

**TABLE 3 Strength Constants**

Grade	<i>K</i> (Strength Constant), psi (MPa)
1	15 000 (105)
2	20 000 (140)
3	30 000 (205)
4	30 000 (205)

lubrication. To obtain oil-free chips, the parts selected for test shall have the oil extracted in accordance with Test Method **B 328**, if necessary.

8.3 *Mechanical Tests*—The manufacturer and purchaser shall agree on a representative number of specimens for mechanical tests.

## 9. Test Methods

9.1 *Density and Oil Content*—Density and oil content shall be determined in accordance with Test Method **B 328**.

9.2 *Radial Crushing Strength*—Radial crushing strength shall be determined by compressing the test specimens between two flat surfaces at a “no-load” speed no greater than 0.2 in./min (5.0 mm/min), the direction of the load being normal to the longitudinal axis of the specimen. The point at which the

load drops as a result of the first crack shall be considered the crushing strength. This test shall be applied to plain cylindrical bearings. Flanged bearings shall be tested by cutting off the flange and compressing the two sections separately. Each section shall meet the minimum strength requirements prescribed in **6.3**.

## 10. Inspection

10.1 Unless otherwise specified, inspection of parts supplied on contract shall be made by the purchaser at the destination.

## 11. Rejection

11.1 Rejection based on tests made in accordance with this specification shall be reported to the manufacturer within 30 days of receipt of shipment; however, the rejected parts should not be returned without authority from the producer.

## 12. Certification

12.1 A certification based on the manufacturer’s quality control that the material conforms to the requirements of this specification, shall be the basis of shipment of the material. A certificate covering the conformance of the material to these specifications shall be furnished by the manufacturer upon request of the purchaser.

## 13. Keywords

13.1 density; iron-base bearings; *K* strength constant; oil content; oil impregnated; porosity