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Standard Specifications for
**METAL POWDER SINTERED BEARINGS
(OIL IMPREGNATED)¹**



ASTM Designation: B 202 - 64

ADOPTED, 1964.²

This Standard of the American Society for Testing and Materials is issued under the fixed designation B 202; the final number indicates the year of original adoption as standard or, in the case of revision, the year of last revision.

Scope

1. These specifications cover sintered, metal powder, oil-impregnated bearings of two types and four classes as follows:

- (a) Grade I, Copper Base:
 - Class A, Copper-Tin
 - Class B, Copper-Lead-Tin

NOTE.—The compositions included in grade I are intended to be equivalent so far as application is concerned, the different compositions representing the products supplied by different manufacturers for the same service.

- (b) Grade II, Iron Base:
 - Class A, Iron-Carbon
 - Class B, Iron-Copper

NOTE.—The compositions in class A represent different mechanical properties and must be identified by subclasses since they constitute separate specifications. The copper content of class B may vary over rather wide limits.

¹ Under the standardization procedure of the Society, these specifications are under the jurisdiction of the ASTM Committee B-9 on Metal Powder and Metal Powder Products.

² Adopted as standard August 31, 1964, by action of the Society at the Annual Meeting and confirming letter ballot.

Prior to adoption as standard, these specifications were published as tentative from 1945 to 1964, being published in 1951, 1955, 1958, and 1960.

Basis of Purchase

2. Orders for material under these specifications shall include the following information:

- (1) Grade (Section 1),
- (2) Dimensions (Note), and
- (3) Certification (Section 10 (b)).

NOTE.—Commercial dimensional tolerances are given in Table VI.

Manufacture

3. Bearings shall be made by briquetting and sintering metal powders so as to produce finished parts conforming to the requirements of these specifications.

Chemical Requirements

4. The material shall conform to the requirements as to chemical composition prescribed in Table I.

Density

5. (a) The density of bearings supplied fully impregnated with lubricant shall be within the limits prescribed in Table II for the type and class specified.

(b) Density shall be determined in accordance with the Methods of Test for Density and Interconnected Porosity of



TABLE I.—CHEMICAL REQUIREMENTS.

	Grade I, Copper Base		Grade II, Iron Base			
	Class A	Class B	Class A			Class B
			A1	A2	A3	
Copper, per cent.....	87.5 to 90.5	82.6 to 88.5	.....	.....	.....	7.0 to 11.0 18.0 to 22.0 remainder ^b
Iron, per cent.....	1.0 max	1.0 max	96.25 min	95.9 min	95.5 min	
Tin, per cent.....	9.5 to 10.5	9.5 to 10.5	.....	.....	.....	.....
Lead, per cent.....	.....	2.0 to 4.0	.....	.....	.....	.....
Zinc, max, per cent.....	.....	0.75	.....	.....	.....	.....
Nickel, max, per cent.....	.....	0.35	.....	.....	.....	.....
Antimony, max, per cent.....	.....	0.25	.....	.....	.....	.....
Silicon, max, per cent.....	.....	.....	0.3	0.3	0.3	.....
Aluminum, max, per cent.....	.....	.....	0.2	0.2	0.2	.....
Carbon, max, per cent.....	1.75 ^c	1.75 ^c	.....	.....	.....	.....
Total other elements by difference, max, per cent.....	0.5	0.5	3.0	3.0	3.0	3.0
Combined carbon ^a (on basis of iron only).....	.....	.....	0.25 max	0.25 to 0.60	0.60 to 1.00	.....

^a The combined carbon may be a metallographic estimate of the carbon in the iron.

^b Total of iron plus copper shall be 97 per cent, min.

^c Commonly graphite. A maximum of 1.5 per cent of another type of solid lubricant may be substituted when authorized by the purchaser.

TABLE II.—DENSITY REQUIREMENTS.

Grade	Class	Density, g per cu cm	
		min	max
I, Copper base	A.....	6.4	6.8
	B.....	6.5	6.9
II, Iron base	A.....	5.7	6.1
	B.....	5.8	6.2

TABLE IV.—MAXIMUM NUMBER OF PIECES IN LOT.

Weight of 1000 Pieces, lb	Maximum Number of Pieces in Lot
Up to 10, excl.....	50 000
10 to 50, excl.....	30 000
50 to 100, excl.....	10 000
100 and over.....	5 000

Sintered Powder Metal Structural Parts and Oil Impregnated Bearings (ASTM Designation: B 328).³

Porosity

6. Porosity in terms of interconnected void space shall not be less than 18 per cent for all classes when determined in accordance with ASTM Method B 328.

Radial Crushing Strength

7. (a) Radial crushing strength shall

TABLE III.—STRENGTH CONSTANTS.^a

Grade	Class	K (strength constant)
I, Copper base	A and B.....	26 500
	A1.....	25 000
II, Iron base	A2.....	30 000
	A3.....	35 000
II, Iron base	B.....	40 000

^a See Section 7 (a).

³ Appears in this publication.

not be less than the value calculated as follows:

$$P = \frac{KLT^2}{D - T}$$

where:

- P = radial crushing strength in pounds,
- D = outside diameter of bearing in inches,
- T = wall thickness of bearing in inches,
- L = bearing length in inches, and
- K = strength constant as shown in Table III for the type specified.

TABLE V.—PERMISSIBLE LOADS.

Shaft Velocity, ft per min	Permissible Loads, psi	
	Grade I	Grade II
Slow and intermittent.....	4000	8000
25.....	2000	3000
50 to 100, incl.....	500	700
Over 100 to 150, incl.....	325	400
Over 150 to 200, incl.....	250	300
Over 200.....	a	a

^a For shaft velocities over 200 ft per min, the permissible loads may be calculated as follows:

$$P = \frac{50,000}{V}$$

where:

- P = safe load in pounds per square inch of projected area, and
- V = shaft velocity in ft per min.

(b) Radial crushing strength shall be determined by compressing the test specimen between two flat surfaces, the direction of the load being normal to the longitudinal axis of the specimen. The point at which the load drops due to 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 Paragraph (a).

Sampling

8. (a) *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. The maximum number of pieces in a lot shall be as prescribed in Table IV.

(b) *Sample for Chemical Analysis*.—At least one sample for chemical analysis shall be taken from each lot. A sample shall consist of not less than 2 oz of chips obtained by milling or drilling from at least two pieces with clean dry tools without lubrication. In order to obtain oil-free chips, the parts selected for test shall be extracted in accordance with Section 6 (b).

(c) *Specimens for Physical Tests*.—At least five specimens from each lot of 10,000 pieces or less, and at least ten specimens from each lot of over 10,000 pieces shall be selected for physical tests.

Workmanship

9. 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.

Inspection

10. (a) Unless otherwise specified, inspection of parts supplied on contract shall be made by the purchaser at the destination.

(b) *Certification*.—A certification based on the manufacturer's quality control that the material conforms to the requirements of these specifications, 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.

Rejection

11. Unless otherwise specified, rejection based on tests made in accordance with these specifications shall be reported to the manufacturer within ten days from receipt of the material by the purchaser.