

# MIL-B-8943A (ASG)

## 5 DECEMBER 1966

Superseding  
MIL-J-8943(ASG)  
10 August 1966

### MILITARY SPECIFICATION

#### BEARINGS, SLEEVE, PLAIN AND FLANGED, TFE LINED

This specification has been approved by the Department of the Air Force and by the Naval Air Systems Command.

#### 1. SCOPE

1.1 This specification covers plain and flanged sleeve bearings which are self-lubricating by incorporating tetrafluoroethylene (TFE) in a liner in the bore for use in a temperature range of  $-65^{\circ}$  to  $+250^{\circ}$  F.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

#### SPECIFICATIONS

##### Federal

TT-S-735 Standard Test Fluids; Hydrocarbon

##### Military

MIL-B-197	Bearings, Anti-Friction, Associated Parts and Sub-Assemblies, Packaging of
MIL-D-1000	Drawings, Engineering, and Associated Lists
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-A-8243	Anti-Icing and Deicing-Defrosting Fluid

#### STANDARDS

##### Federal

FED. TEST METHOD STD. NO. 141	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing
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FSC 3120

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Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MS21240	Bearing, Sleeve, Plain, TFE Lined
MS21241	Bearing, Sleeve, Flanged, TFE Lined

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications.- The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect in date of invitation for bids or request for proposal shall apply.

American Standards Association

ASA B46.1 - 1962 Surface Texture, Surface Roughness, Waviness and Lay

(Application for copies should be addressed to the American Standards Association, 10 East 40th Street, New York, New York 10016.)

Uniform Classification Committee

Uniform Freight Classification Rules

(Application for copies of the above publication should be addressed to the Uniform Classification Committee, 202 Chicago Union Station, Chicago, Ill. 60606.)

## 3. REQUIREMENTS

3.1 Qualification.- The bearing furnished under this specification shall be a product which is in accordance with the applicable Military Standard (MS) and which has been subjected to and which has passed the qualification tests specified herein, and which has been listed on or approved for listing on the applicable Qualified Products List.

3.1.1 Product design change.- Any change in product design or description will require requalification of the product to an extent determined by the qualifying activity.

3.2 Materials.- Material for the sleeve and liner shall be in accordance with the applicable MS. TFE shall be included in the liner in such manner that the bearing will conform to all requirements of this specification.

3.3 Design.- Bearing design shall conform to that shown on MS21240 and MS21241.

3.4 Construction.- The liner shall be so secured that all relative motion will be between the liner and the shaft. Except as otherwise specified on the applicable MS, the details of the design shall be optional.

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3.4.1 Dimensions and tolerances.- Dimensions and tolerances shall be as specified on the applicable MS. Dimensions not shown shall be at the option of the manufacturer.

3.4.2 Surface finish.- The surface of the outside diameter shall have a finish of roughness height rating (RHR) 63 maximum in accordance with ASA B46.1, 1962. All other metallic surfaces shall have a finish of RHR 125 maximum. Bearings shall be free of any surface defects which may be detrimental to satisfactory installation, performance, or bearing life as defined in this specification.

3.4.3 Lubrication.- Initial lubrication by the manufacturer will be permitted. Relubrication will not be permitted.

### 3.5 Performance.-

3.5.1 Radial static limit load.- After the radial load listed in table I has been applied as specified in 4.6.1, the permanent set shall be less than 0.004 inch.

3.5.2 Oscillation radial load.- The total liner wear of the bearing shall not exceed 0.006 inch when tested in accordance with 4.6.2 with the radial unidirectional load listed in table I.

TABLE I. Load values

Part No.	Static limit load (lbs.)	Oscillating load (lbs.)	Test torque (in./lbs. max.)
MS21240-08A04	5,700	3,500	44
-08C04	5,700	3,500	44
-16A08	26,400	12,100	300
-16C08	26,400	12,100	300
-24A08	39,600	15,200	570
-24C08	39,600	15,200	570

3.5.3 Fluid compatibility.- When tested in accordance with 4.6.3, the bearings shall be compatible with the fluids listed in 4.6.3 and the total liner wear shall not exceed 0.006 inch.

3.5.4 Corrosion resistance.- Corrosion resistance shall be determined in accordance with Method 6201 of Fed. Test Method Std. No. 141. Superficial tarnish which can be removed with a damp cloth will not be cause for rejection.

3.5.5 High temperature.- When tested in accordance with 4.6.5, under the oscillating load specified on the applicable MS, the total liner wear shall not exceed 0.006 inch.

3.6 Interchangeability.- All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other and with respect to installation and performance. The drawing number requirements of MIL-D-1000 shall govern changes in the manufacturer's part numbers.

3.7 Identification of product.- Each bearing shall be permanently and legibly marked with the manufacturer's name or trademark. Metal impression stamping is prohibited.

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3.8 Workmanship.- The bearings shall be free of toolmarks, chatter waves, rust, grinding scratches, pits, or other defects that may adversely affect their serviceability.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Qualification test records.- The manufacturer shall maintain a record showing quantitative results for all tests required by this specification. This record shall be available to the purchaser and shall be signed by an authorized representative of the manufacturer or the testing laboratory, as applicable.

4.2 Classification of tests.- The inspection and testing of the bearings shall be classified as:

- (a) Qualification tests (4.3)
- (b) Quality conformance tests (4.4)

#### 4.3 Qualification tests.-

4.3.1 Sampling instructions.- Qualification test samples shall consist of 15 bearings conforming to MS21240-08A04 plus 15 bearings of each type (plain or flanged) of the following bore diameters, widths, and housing materials for which qualification is desired. All bearings necessary for tests specified herein shall be furnished by the manufacturer. Samples shall be identified as required and forwarded to the activity designated in the letter of authorization from the activity responsible for qualification (see 6.3).

When approved:	-08C04	will qualify	-040 thru	-090
	-08A04	" "	-04A "	-09A
	-16C08	" "	-10C "	-18C
	-16A08	" "	-10A "	-18A
	-24C08	" "	-20C "	-30C
	-24A08	" "	-20A "	-30A

4.3.2 Certified test report.- The manufacturer shall furnish a certified test report showing that the manufacturer's product satisfactorily conforms to this specification. The test report shall include, as a minimum, actual results of the tests specified herein. When the report is submitted, it shall be accompanied by a dated drawing which completely describes the manufacturer's product by specifying all dimensions and tolerances, outer race material, coating or plating, and heat treatment. The manufacturer's part number for each size shall be included on the drawing.

4.3.3 Tests.- Qualification tests shall include all the examinations and tests of this specification. The minimum number of samples per test shall be in accordance with table II.

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TABLE II. Qualification test samples

Examination and tests	Paragraph number	Samples to be tested
Examination of product	4.5.1	5
Preparation for delivery	4.5.2	5
Radial static limit load	4.6.1	3
Oscillating radial load	4.6.2	3
High speed oscillating load	4.6.2.1	1
Fluid compatibility	4.6.3	3 (MS21240-08A04 only)
Corrosion resistance	4.6.4	3
High temperature	4.6.5	3

4.4 Quality conformance tests.- The quality conformance testing of the bearings shall consist of the following examinations and tests to determine conformance of the bearings to the requirements of this specification and the applicable MS with regard to:

- |                               |         |         |
|-------------------------------|---------|---------|
| (a) Dimensions                | (3.4.1) | (4.5.1) |
| (b) Identification of product | (3.7)   | (4.5.1) |
| (c) Workmanship               | (3.8)   | (4.5.1) |
| (d) Preparation for delivery  |         | (4.5.2) |

4.4.1 Tests.- The bearing manufacturer shall be responsible for accomplishing the quality conformance tests specified herein.

4.4.2 Lot.- The lot definition, formation, and size shall be in accordance with MIL-STD-105.

4.4.3 Sampling.- The sample bearings shall be selected in accordance with MIL-STD-105, inspection level II, acceptable quality level of 1.0 percent.

#### 4.5 Examinations.-

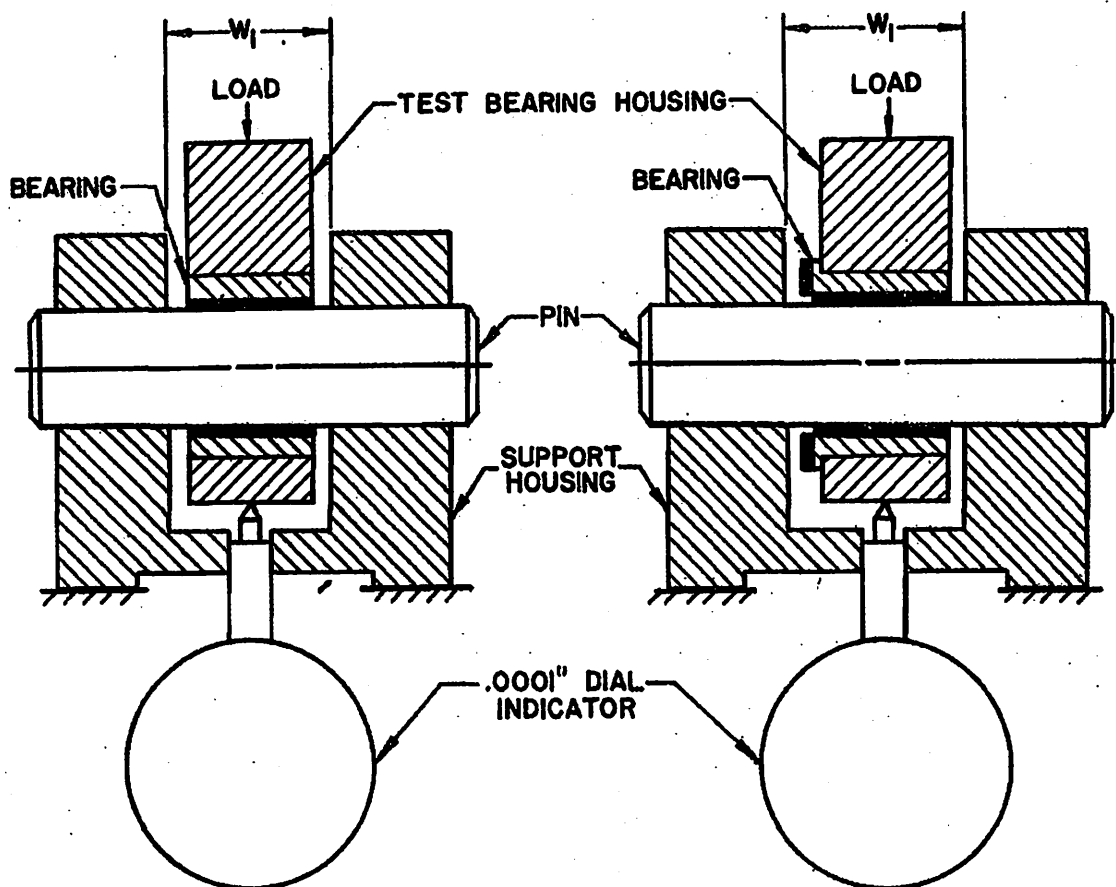
4.5.1 Examination of product.- The bearings shall be examined to determine conformance to the requirements of this specification and the applicable MS for material, dimensions, finish, identification of product, workmanship, and requirements not covered by tests.

4.5.2 Preparation for delivery.- Preservation, packaging, packing, and marking shall be inspected to determine conformance to section 5.

4.6 Test methods.- Unless otherwise specified, all tests shall be conducted at room temperature.

4.6.1 Radial static limit load.- The bearings shall be installed in a test fixture as shown on figure 1, using a 0.0000 to 0.0011 interference fit with the housing and a 0.002 to 0.004-inch loose fit with the pin. The use of differential temperatures for installation will not be allowed. A preload of 4 to 6 percent of the radial static load shall be applied to the bearing for 3 minutes, and the measuring device set at zero. The load shall then be increased at the rate of 1 percent of the specified load per second until it equals the radial static load limit. The load shall then be reduced at the same rate to the preload value. The permanent set shall be the reading at preload.

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**PIN: DIAMETER =  $B - .0041$**

**MATERIAL = STEEL 50 Rc MIN**

**FINISH =  $8 \mu$  MAX**

**NOTE: TAPER ONE END  $1/2$ " MIN LENGTH; TAPERED END TO EXTEND BEYOND SUPPORT HOUSING WHEN ASSEMBLED**

**TEST BEARING HOUSING: BORE =  $D - .0005 / - .0006$**

**WIDTH =  $L \text{ MAX } + .002 / - .000$**

**LENGTH =  $2 D \text{ MIN}$**

**SUPPORT HOUSING: BORE =  $\text{PIN DIA MAX } + .0007 / + .0002$**

**SUPPORT WIDTH =  $(L \text{ MAX}) \cdot \text{MIN}$**

**LENGTH =  $(2) (\text{PIN DIA MIN})$**

**$W_1 = L + .025 / + .030$**

**FIGURE 1. Radial test fixture.**

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**4.6.2 Oscillating radial load.-** The bearing shall be installed in a steel housing, using a 0.0000 to 0.0011-inch interference fit with the housing and a 0.002 to 0.004-inch loose fit with the pin. The bearing shall be so gripped as to place the pin in double shear with a minimum of pin bending. A dial indicator or electronic pickup shall be so mounted that any radial movement of the pin or the bore of the bearing with respect to the outer race can be measured. The oscillating load specified in table I shall be applied and held statically for 15 minutes. At the end of this time, the indicating device shall be set at zero and the oscillating test shall be started. Wear readings shall include the wear from the first cycle on. The test shall be run in such manner that the pin is oscillated  $\pm 25$  degrees (50 degrees total) at 10 cycles per minute for 5,000 cycles. One cycle shall consist of rotation from zero degrees to  $+25$  degrees, return through zero degrees to  $-25$  degrees and return to zero degrees. The wear within the bearing shall not exceed 0.006 inch at the end of 5,000 cycles. Sufficient intermediate readings during the test shall be recorded to plot a graph of wear (thousandths of an inch) vs. life (cycles). In addition, upon completion of the test, the loaded breakaway torque shall be as specified in table I.

**4.6.2.1 High speed oscillation.-** A bearing shall be installed in a fixture as specified in 4.6.2. The test shall be run in such manner that the pin is oscillated  $\pm 10$  degrees (20 degrees total) at 200 cycles per minute for 1,000,000 cycles while the bearing is loaded to 40 percent of the oscillating load specified in table I.

**4.6.3 Fluid compatibility.-** Fifteen bearings conforming to MS21240-08A04 (3 for each fluid) shall be immersed for 24 hours in each of the following fluids at  $160^{\circ} \pm 5^{\circ}$  F, except for (b) which shall be at  $100^{\circ} \pm 5^{\circ}$  F:

- (a) Skydrol 500A hydraulic fluid
- (b) TT-S-735, type VII standard test fluid
- (c) MIL-L-7808 lubricating oil
- (d) MIL-H-5606 hydraulic oil
- (e) MIL-A-8243 anti-icing fluid

Within 1/2 hour after removal from the test fluid the bearing shall be tested in accordance with 4.6.2. The load for (e) shall be 65 percent of that listed in table I for oscillating load.

**4.6.4 Corrosion resistance.-** The bearing shall be tested in accordance with Method 6201 of Fed. Test Method Std. No. 141. Exposure shall be at  $120^{\circ} \pm 5^{\circ}$  F for 96 hours at 95 percent relative humidity. Within 4 hours after completion of the test the bearing shall be tested in accordance with 4.6.2. The load shall be 80 percent of that listed in table I for oscillating load.

**4.6.5 High temperature.-** The bearing shall be subjected to the test of 4.6.2, except that the fixture shall be placed in an air circulating oven at a temperature of  $250^{\circ} \pm 2^{\circ}$  F. The fixture shall be held at this temperature long enough to stabilize at the test temperature before the start of the test.

## 5. PREPARATION FOR DELIVERY

### 5.1 Cleaning, preservation, and packaging.-

**5.1.1 Level A.-** Cleaning, preservation, and packaging shall be in accordance with level A of MIL-B-197.

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5.1.2 Level C.- Cleaning, preservation, and packaging shall be in accordance with the contractor's commercial practice.

5.2 Packing.-

5.2.1 Level A.- Bearings, cleaned, preserved, and packaged as specified in 5.1.1, shall be packed for overseas shipment in accordance with MIL-B-197.

5.2.2 Level B.- Bearings, cleaned, preserved, and packaged as specified in 5.1.1, shall be packed for domestic shipment and storage in accordance with MIL-B-197.

5.2.3 Level C.- Bearings, cleaned, preserved, and packaged as specified in 5.1.2, shall be packed in a manner to insure carrier acceptance and safe delivery at destination. The containers shall be in accordance with the Uniform Freight Classification Rules or regulations of other carriers, as applicable to the mode of transportation.

5.3 Marking of shipments.- Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129. The nomenclature shall include:

BEARINGS, SLEEVE, PLAIN AND FLANGED, TFE LINED

## 6. NOTES

6.1 Intended use.- The bearings are intended primarily for use in applications where moderate friction and bearing play at low rotational oscillatory speeds are not objectionable.

6.2 Ordering data.- Procurement documents should specify:

- (a) Title, number, and date of this specification.
- (b) MS part number (see 3.3).
- (c) Applicable levels of preservation, packaging, and packing (see 5.1 and 5.2).

6.3 Qualification.- With respect to products requiring qualification, awards shall be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Navy Department, Washington, D. C. 20360; however, information pertaining to qualification of products may be obtained from the Naval Air Engineering Center, Philadelphia, Pennsylvania 19112, Attention: Code XM-62.



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6.3.1 Qualification tests will be authorized only upon presentation of certified test reports and drawings indicating that the bearings conform to this specification.

Custodians:  
Navy - AS  
Air Force - 11

Preparing activity:  
Navy - AS

Reviewer activities:  
Navy - AS  
Air Force - 11, 84

\*U.S. GOVERNMENT PRINTING OFFICE: 1987-251-515/3422