MIL-B-8976(ASG)
6 FEBRUARY 1969
Superseding
MIL-B-5628
28 February 1950

MILITARY SPECIFICATION

BEARINGS, PLAIN, SELF-ALIGNING, ALL-METAL

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

1. SCOPE

1.1 This specification covers airframe all-metal plain spherical bearings which are self-aligning for use between -65° F and 250° F.

1.2 Classification. - Bearings shall be of the following types, as specified (see 6.2):

Type I - Grooved outer race
Type II - Chamfered outer race

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

QQ-C-320	Chromium Plating (Electrodeposited)
QQ-P-416	Plating, Cadmium (Electrodeposited)

Military

MIL-B-197	Bearing, Anti-friction, Associated Parts, and Subassemblies, Packaging of
MIL-G-21164	Grease, Molybdenum Disulfide (For Low and High Temperatures)
MIL-D-1000	Drawings, Engineering and Associated Lists

FSC 3120

STANDARDS

Federal

FED. TEST METHOD STD. NO. 151	Metals; Test Methods

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of US Military Property
MS21154	Bearing, Plain, Self-Aligning, Grooved Outer Ring
MS21155	Bearing, Plain, Self-Aligning

(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 document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

United States of America Standards Institute

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

(Copies of the above publication may be obtained from the United States of America Standards Institute, 10 East 40th Street, New York, N.Y. 10017.)

Uniform Classification Committee

Uniform Freight Classification Rules

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

3. REQUIREMENTS

3.1 Qualification. - The bearings furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.2).

3.1.1 Product design change. - Any change in product design or description may require requalification of the product to an extent determined by the activity responsible for qualification.

3.2 Materials. - The ball and outer race shall be in accordance with the applicable MS when examined in accordance with 4.5.1.

3.2.1 Plating. - Cadmium plating shall be in accordance with type I, class 2 of QQ-P-416. Chrome-plating shall be in accordance with QQ-C-320, class 2, 0.0002 minimum thickness on spherical surfaces and 0.00005 on faces.

3.3 Design. - Bearing design shall conform to that specified on MS21154 and MS21155.

3.4 Construction. - Except as otherwise specified, the details of the working parts shall be optional. The bearings shall not have loading slots.

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. - Surface finishes shall have a roughness height rating (RHR) in accordance with USASI B46.1 and as shown on the applicable MS.

3.4.3 Lubrication. - The bearings shall be thoroughly cleaned and dried in accordance with MIL-B-197. The mating spherical surfaces, lubricant groove and bore shall be coated with grease conforming to MIL-G-21164.

3.4.4 Hardness. - The hardness shall be as specified on the applicable MS.

3.5 Performance. -

3.5.1 Radial static limit load. - After the radial static load listed on the applicable MS has been applied as specified in 4.6.1, the permanent set shall not exceed the applicable value shown in table I.

3.5.2 Axial static limit load. - After application of the axial static limit load specified on the applicable MS has been applied as specified in 4.6.2, the permanent set shall not exceed the applicable value shown in table I.

3.5.3 Ultimate load. - No fracture of the ball or race or push-out of the ball shall occur when 1-1/2 times the radial or axial load specified on the applicable MS is applied, as specified in 4.6.1 and 4.6.2.

3.5.4 Self-alignment. - The bearing shall be self-aligning and shall permit the angular displacement specified on the applicable MS.

3.5.5 Internal play. - When tested in accordance with 4.6.3, radial and axial play shall not exceed the values specified in table I.

TABLE I. Radial static limit load

Dash No.	Permanent set (inches)		Internal play (inches)	
	Radial	Axial	Radial	Axial
S04 S05 S06 S07 S08 S09 S10 S12 S14 S16	0.003	0.004	0.001 .002	0.010 (max.)
B04 B05 B06 B07 B08 B09 B10 B12 B14 B16	0.003	0.004	0.001 .002	0.010 (max.)

3.6 Interchangeability. - All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other 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 in accordance with MIL-STD-130 with the MS number and manufacturer's part number, name, or trademark. Identification shall appear on the periphery of the bearing outer race. Metal impression stamping is prohibited.

3.8 Workmanship. - The bearings shall be free of tool marks, chatter waves, rust, grinding scratches, pits, or any 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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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.

4.2 Classification of inspections. - The examination and testing of the bearings shall be classified as:

(a) Qualification inspection (4.3)
(b) Quality conformance inspection (4.4)

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

TABLE II. Qualification test samples

Examinations and tests	Paragraph number	Samples to be tested
Examination of product	4.5.1	5
Preparation for delivery	4.5.3	5
Radial static limit load	4.6.1	3
Axial static limit load	4.6.2	3
Internal play	4.6.3	3

4.3.1 Sampling instructions. - Qualification test samples shall consist of six bearings of each size, and material, as specified on MS21154, for which qualification is desired. Approval of the MS21154 bearing shall constitute qualification of the MS21155 bearing of the same size and material. 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).

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 rawing which completely describes the manufacturer's product

by specifying all dimensions and tolerances, composition of the ball and outer race material, coating or plating, and heat treatment. The manufacturer's part number for each size shall be included on the drawing.

4.4 Quality conformance inspections. - The quality conformance inspection of the bearings shall consist of the following examinations and tests to determine conformance of the bearings to 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	(4.5.3)
(e)	Internal play	(3.5.6, 4.6.3)
(f)	Hardness	(3.4.4, 4.6.4)

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

4.4.2 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. -

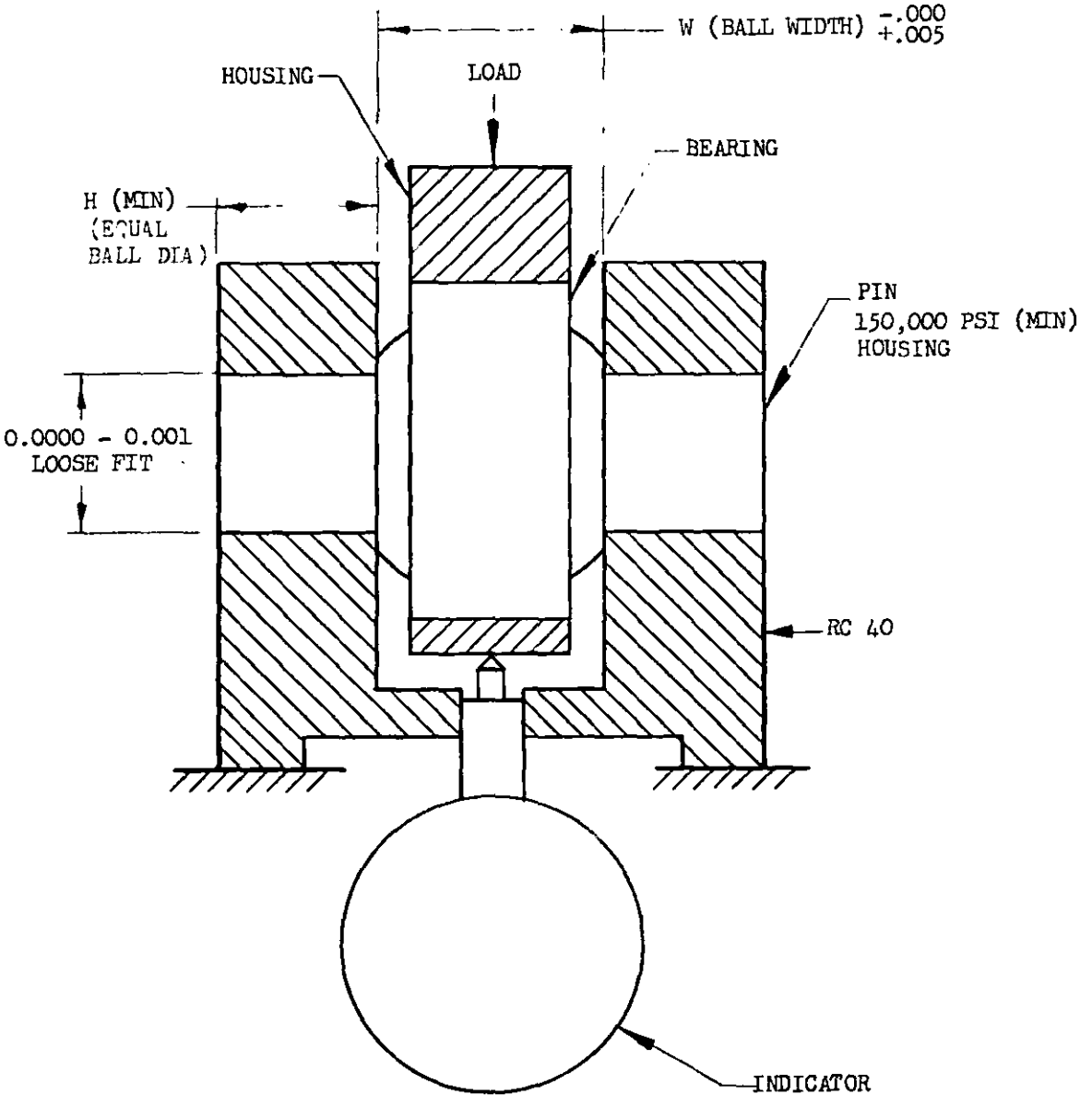
4.5.1 Examination of product. - The bearings shall be examined to determine conformance to this specification and the applicable MS for material, plating dimensions, finish, identification of product, workmanship, and requirements not covered by tests.

4.5.2 Material certification. - The manufacturer shall furnish to the qualifying activity a material certification specifying the composition of the material used in the manufacture of the bearings.

4.5.3 Inspection of 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 performed 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 an 0.000- to 0.001-inch loose fit for the shaft and the housing. 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 15 seconds and the measuring device set at zero. The load shall then be increased at a rate not to exceed 2 percent of the specified load per second until it equals the radial static limit load. The load shall then be reduced at the same rate to the preload value. The permanent set shall be the reading at preload. The ultimate radial load (see 3.5.3) shall be applied at a rate not to exceed 2 percent of the specified load per second.



PIN SHALL BE RC50 MINIMUM

DIMENSIONS IN INCHES

FIGURE 1. Radial test fixture

4.6.2 Axial static limit load. - The test bearing shall be installed in a test fixture as shown on figure 2. Bearings shall fit in the housing with an 0.000- to 0.001-inch loose fit. The hole in the support fixture for clearance of the ball shall be the nominal diameter of the ball plus 0.020. The bearing shall be preloaded between 4 to 6 percent of the axial load limit. After holding for 15 seconds, the measuring device shall be set at zero. The load shall be increased at a rate not to exceed 2 percent of the specified load per second until it equals the axial static limit load. It shall be held for 1 minute, then reduced at the same rate to the preload value. The permanent set shall be the reading at preload. The ultimate axial load (see 3.5.3) shall be applied at a rate not to exceed 2 percent of the specified load per second.

4.6.3 Internal play. -

4.6.3.1 Radial play. - Radial play shall be measured with a 5-1/2-pound measuring load applied to one member (inner or outer) perpendicular to the bore axis successively in opposite directions. The other member shall be rigidly clamped. Radial play shall be the full dial movement less shaft clearance.

4.6.3.2 Axial play. - Axial play shall be measured with a 5-1/2-pound measuring load applied to the inner member parallel to the bore axis successively in opposite directions. The outer member shall be rigidly clamped. The axial play is equal to the full dial movement.

4.6.4 Hardness. - Hardness tests shall be performed as specified in new Federal Test Method Standard No. 151.

5. PREPARATION FOR DELIVERY

5.1 Cleaning, preservation, and packaging. -

5.1.1 Levels A and B. - Cleaning, preservation, and packaging shall be in accordance with levels A and B of MIL-B-197.

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.

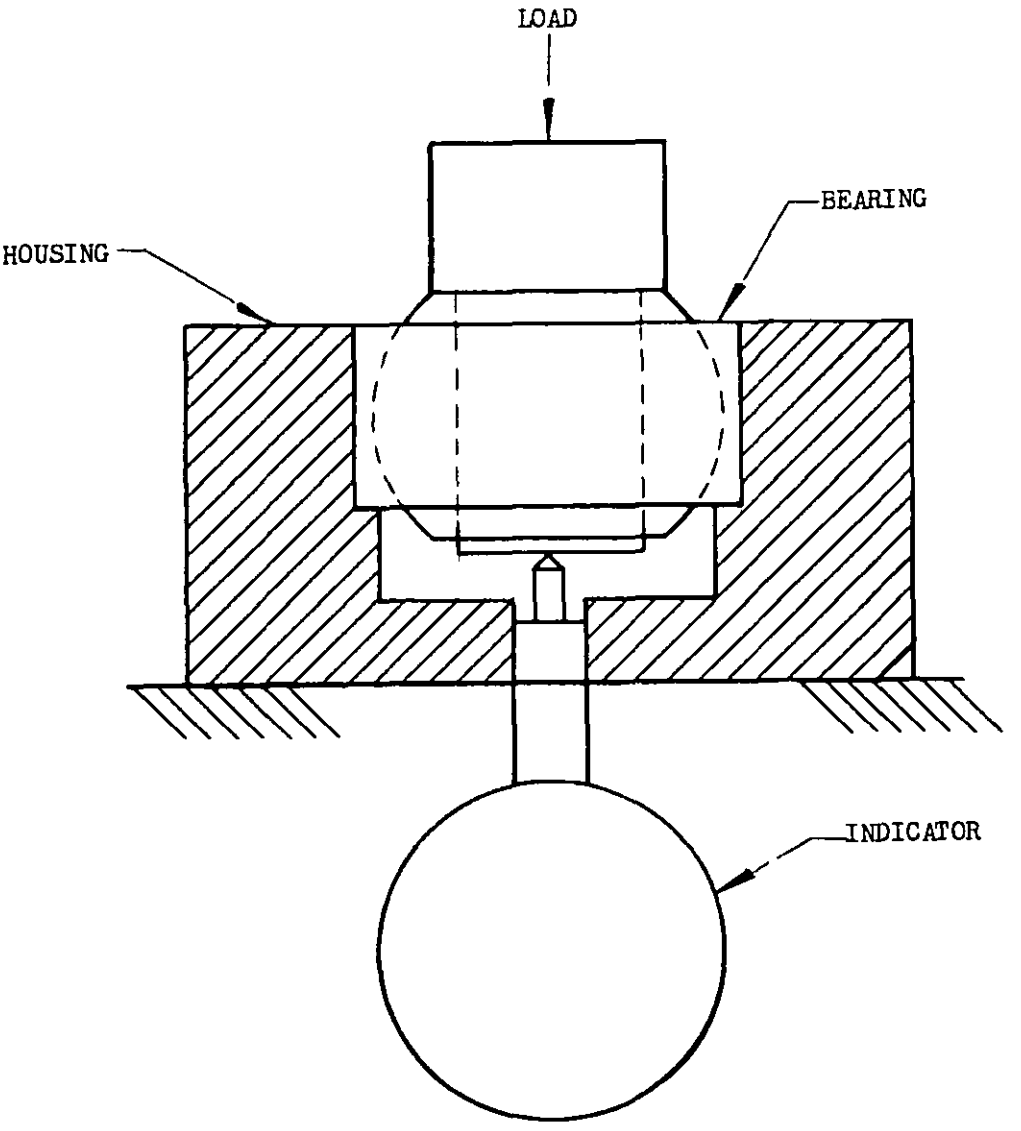


FIGURE 2. Axial test fixture

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, PLAIN, SELF-ALIGNING, ALL-METAL

6. NOTES

6.1 Intended use. - Plain self-aligning all-metal bearings are intended for use in airframe power-actuated systems and joint applications where moderate friction is not objectionable and where relubrication provisions are available.

6.1.1 Steel race bearings are intended for heavily loaded static applications where slight oscillation and misalignment may occur due to structural deflections.

6.1.2 Aluminum bronze race bearings are intended for applications involving high oscillatory loads and moderate static loads.

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.

6.3 Qualification. - With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified 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 Development Center, AMD, Code MAEM, Johnsville, Warminster, Pennsylvania 18974.

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

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

Preparing activity:
Navy - AS

Project No. 3120-N016

SPECIFICATION ANALYSIS SHEET

Form Approved Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.

SPECIFICATION MIL-B-8976(ASG) BEARINGS, PLAIN, SELF-ALIGNING, ALL-METAL

ORGANIZATION		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT $

MATERIAL PROCURED UNDER A

( ) Direct Government Contract ( ) Subcontract

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID.

3. IS THE SPECIFICATION RESTRICTIVE?

   ( ) YES ( ) NO IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.)

SUBMITTED BY (Printed or typed name and activity) DATE

DD Form 1426