

INCH - POUND

MIL-B-17901B(SH)
AMENDMENT 3
12 December 1990
SUPERSEDING
AMENDMENT 2
10 June 1988

MILITARY SPECIFICATION

BEARING COMPONENTS, BONDED SYNTHETIC RUBBER,
WATER LUBRICATED

This amendment forms a part of MIL-B-17901B(SH), dated 17 June 1983, and is approved for use by the Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

PAGE 1

* 1.2: Add after the last line:

"Class IV - Cylindrical bearings, with cylindrical shaped nonmetallic backing and internally molded rubber stave forms."

PAGE 3

* 3.2 line 3 add "date of manufacture,"

3.2.1(b): Delete and substitute:

"(b) Hardness - Initial hardness shall be as follows (plus or minus 5 points):

- Class I - 85 points, shore A durometer, instantaneous
- Class II - 70 points, shore A durometer, instantaneous
- Class III - 85 points, shore A durometer, instantaneous
- Class IV - 70 points, shore A durometer, instantaneous

* 3.2.3, Table I, under Static castings across from Naval brass and Valve bronze, and after QQ-C-390 add: "alloy 903"

AMSC N/A

FSC 3130

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* 3.2.4 Delete and substitute:

"3.2.4. Non-metallic backing for class III bearing staves and class IV cylindrical bearings. Non-metallic backing for class III bearing staves and for class IV cylindrical bearings shall meet the physical requirements in accordance with table II."

Table II, Delete and substitute:

"TABLE II. Physical requiremenes for non-metallic backing.
(Class III and class IV bearings only)

PROPERTY	UNITS OF MEASUREMENT	CLASS III REQUIRED TEST VALUE	CLASS IV REQUIRED TEST VALUE	TEST IN ACCORDANCE WITH	REMARKS
HARDNESS	SHORE D	64 MINIMUM 95 MAXIMUM	70 MINIMUM 100 MAXIMUM	ASTM D 2240	
TENSILE STRENGTH	LB/IN ²	3900 MINIMUM	24,000 MINIMUM	ASTM D 638	
YIELD	LB/IN ²	2600 MINIMUM	—	ASTM D 638	
FLEXURAL MODULUS	SECANT MODULUS MEASURED AT A MAXIMUM 1 PERCENT STRAIN LB/IN ²	45,000 AT 73°F MINIMUM	1.9 X 10 ⁶ AT ROOM TEMPERATURE MINIMUM	ASTM D 790	TEST USING METHOD 1
IMPACT RESISTANCE	FT-LB/INCH	.8 MINIMUM	14 MINIMUM	ASTM D 256	10 SAMPLES TESTED WITH METHOD "A" AND A 45 DEGREE NOTCH
WATER ABSORPTION	PERCENT OF SPECIMEN VOLUME	0.2 PERCENT MAXIMUM	1.0 PERCENT MAXIMUM GAIN OR LOSS	ASTM D 570	IMMERSED 24 HOURS AT A WATER TEMPERATURE OF 23 ± 1° C
OIL ABSORPTION	PERCENT OF SPECIMEN VOLUME	1 PERCENT MAXIMUM	1.0 PERCENT MAXIMUM GAIN OR LOSS	4.7.4.1 AND 4.7.4.3	

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4.3: Add at the end of the paragraph: "Bearings that have been qualified require requalification at five year intervals. Qualification continuance tests shall be conducted at a laboratory satisfactory to NAVSEA and shall consist of the same tests and procedures specified for the qualification tests above. Three copies of the qualification continuance test reports shall be forwarded to NAVSEA. Action to maintain approval of the material shall be taken by NAVSEA on the basis of the test results. If qualification continuance test results are not received before the expiration of five years from the date of a qualification or prior qualification continuance test approval, such approval will be withdrawn, and the product removed from the Qualified Products List."

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* TABLE III - Add "and IV" in each of the two columns and in the title where class II is referenced.

PAGE 9

- * 4.4(b), line 1: Add "and IV" after "class II".
- * 4.5.1, line 2: Add "(except length)" after "dimensions".

PAGE 11

- * 4.5.4, line 2: Add "and IV" after "class II".
- 4.5.4, line 4: Delete "and be of the split type".

PAGE 12

4.5.4(d): Delete and substitute:

"(d) Specimens for volume change test. Obtain the rubber specimens for the volume change test from the facing material of six bearing segments by removing the rubber facing from the backing. Buff the rubber of each segment to a flat surface. Cut one specimen 2 inches by 1 inch with a thickness not to exceed 1/16 inch from the surface of the segments. These specimens are now ready for aging (see 4.7.4.2 and 4.7.4.3)."

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- * 4.5.6, line 2: Add "and IV" after "class II"
- line 5: Add "and IV" after "class II"
- line 10: Add "and IV" after "class II"

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4.6.2: Delete and substitute:

"4.6.2 Dimensional inspection. Sample bearings shall be dimensionally inspected for conformance to the requirements as specified in Drawing 803-1385664 and 3.2.1(d). As a minimum, the following dimensions shall be measured and recorded for each sample at ambient air temperature of 75±5 degrees F.

(a) For class I and III - the stave width (using across pins method, Johnson gage thread pitch diameter and functional size method or Go, No-Go gages), thickness, length, side angle backing radius and bearing face surface finish.

(b) For class II and IV - the bore, outside diameter, flange dimensions, length, and bearing face surface finish."

4.6.2.1: Add as new paragraph:

"4.6.2.1 Procedure for measuring bearing face surface finish. Surface finish of the flat rubber facing shall be measured using a light contact stylus with maximum stylus force of 1.0 milli-Newton (mN) (0.225×10^{-3} pound force). The measuring equipment shall be Talysurf 10 or equal and shall have a 90 degree, four sided, pyramid, diamond stylus with a tip width of 0.0001 inch (0.0025 mm). Other surface finish measuring equipment is acceptable provided they have been calibrated with a Talysurf 10 at a range of finishes which include 64 microinches R_A . The equipment shall be calibrated with a roughness standard just prior to and following measurements. A cutoff or roughness sampling length of 0.030 inch (0.80 mm) shall be used. For class I and III, three measurements each shall be taken along the length of the rubber and perpendicular to it, and each measurement shall be 64 microinches R_A or less. For class II and IV bearings the surface finish on the rubber face should be measured lengthwise on at least three land areas. Each measurement should be 64 microinches or less."

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* 4.7.1 Add "and IV" after class III.

* 4.7.2 Add "and IV" after class III.

4.7.4.1, line 11: Delete "bottled" and substitute "blotted".

4.7.5, line 4: Delete "devise" and substitute "device".

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4.7.5, line 5: Delete "steady" and "is".

4.7.6: Add to line 5 after class II, "and class IV". Add at the end of the paragraph: "Tests shall be performed at David Taylor Research Center (DTRC) Annapolis, MD. If the bearing should fail any or part of any performance test or any examination associated with performance tests, DTRC may terminate further testing of those bearings until problems have been resolved."

PAGE 17

4.7.6.1: Delete and substitute:

"4.7.6.1 Wear test. Three test specimens shall be prepared in accordance with 4.7.6.1.1. Each test specimen shall be identified by permanent markings on the back face of the test piece. A journal, made in accordance with figure 4, shall be used to measure wear of the subject bearing material and journal. The same journal shall be used for the three specimen tests. The thickness in the wearing direction shall be measured to the nearest 0.001 inch for each specimen before testing. The diameter of the journal shall be measured to the nearest 0.001 inch. Each specimen shall be positioned so it contacts the journal in the center (widthwise). The journal speed is specified in MIL-P-18324. The specimen contact load is 1.76 lbf. The abrasive and lubricant specified in MIL-P-18342 shall be evenly distributed across the specimen width. The lubricant shall be maintained at 75±5 degrees F. The length of the test for each specimen is 10 hours. The journal diameter shall be measured in the area of heaviest wear to the nearest 0.001 inch following each specimen test. The minimum thickness of each specimen shall be measured to the nearest 0.001 inch. The wear shall be calculated by subtracting the final from the initial measurement."

* 4.7.6.1.1 (b), Add "and IV" after class II.

4.7.6.1.2: Delete and substitute:

"4.7.6.1.2 Wear test requirements. The average specimen wear shall be computed from the three samples tested. The total journal wear shall be determined from the original diameter. The average bearing specimen wear shall not exceed 0.100 inch. The total journal wear shall not exceed 0.030 inch. If the thickness of the bearing rubber surface is less than 0.100 inch and the wear exceeds this thickness, the product shall be failed and no further tests will be conducted on that material."

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4.7.6.2: Delete and substitute:

"4.7.6.2 Friction tests. Tests shall be performed at speeds ranging from 5 to 400 revolutions per minute (r/min). Compensation for the tare torque of the support bearings and seal shall be made. A 6-3/4 inch diameter journal made of 70-30 copper-nickel shall be used for the friction test. The surface finish of the journal shall be less than 32 microinches R_A . The bearing shall be immersed in clean tap water at 70 ± 5 degrees F prior to friction test and during all subsequent static and dynamic tests. Initial start up runs shall be performed at 60 r/min on the stave assembly by increasing the radial bearing unit loading in 10 lb/in² increments until test loads of 40 lb/in² based upon projected bearing area (journal length x journal diameter) is reached. The rate of load application depends upon the frictional behavior of the bearing and limitations of the drive system. Load shall be applied at a rate such that the torque will not exceed 500 inch pounds (in-lb). If the 40 lb/in² test load cannot be reached in an 8-hour period to prepare for break-in, due to high friction and torque loads exceeding 500 in-lb, the subject bearing shall be considered failed and no further tests shall be conducted. Once the 60 r/min, 40 lb/in² load condition has been reached, the shaft shall be continuously operated under those conditions for 25 hours. Torque shall be periodically recorded during the 25-hour break-in. Following break-in, the load shall be removed, drive motor shut down and shafting freed up to determine and record zero drift of torque measuring instrumentation. The test shall be immediately restarted and the speed of the journal increased to 400 r/min, after which a load of 40 lb/in² shall be applied. Torque levels shall be recorded upon reaching 400 r/min and 40 lb/in² and after 15 minutes operation under those conditions. The shaft shall again be stopped and the zero drift measured and recorded. This procedure shall be repeated for the following speeds: 250, 100, 60, 40, 30, 20, 10, and 5 r/min. Tare torque and zero corrections shall be applied to measured torque values. Tare torque accounts for friction in the machine bearings and seals; zero correction accounts for drift in the torque measuring instrumentation. During the entire test, the machine shall operate smoothly and there shall be no evidence of stick-slip vibration at any speed in the test range. Friction coefficients for the dynamic conditions at 400, 250, 100, 60, 40, 30, 20, 10, and 5 r/min shall be calculated based upon the formula:

$$T_{\text{bearing}} = fPR$$

where:

$$T_{\text{bearing}} = \text{corrected bearing torque in in-lb.}$$

$$P = \text{normal applied bearing radial load in pounds.}$$

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R = journal radius in inches.
f = friction coefficient.

Following dynamic friction tests, static friction values shall be determined by applying 40 lb/in² load to the journal at rest. Torque shall be applied to the input shaft of the tester. Torque shall be recorded on a strip chart recorder during torque build-up and breakaway. Load shall be applied for a length of time 3 hours before torque is applied to rotate the shaft. The test shall be duplicated three times and the average of those three values of torque determined. The corresponding friction coefficient shall be calculated using the formula above."

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4.7.6.2.2: Delete and substitute:

"4.7.6.2.2 Friction test requirements. The dynamic friction coefficients after 15 minutes operation, under the various speed conditions shall not exceed the following values:

(a) Dynamic friction coefficients

<u>Speed</u>	<u>Maximum acceptable friction coefficient</u>
400	0.020
250	.020
100	.020
60	.020
40	.030
30	.040
20	.090
10	.160
5	.250

If one or more values exceed the maximum allowable values, the second test shall be conducted on the unloaded half of the bearing. The entire procedure for break-in and dynamic testing as described in 4.7.6.2 shall be repeated for this test. If one or more dynamic friction coefficient values again exceeds the maximum allowable values listed above, the bearing will be considered to have failed the dynamic test requirements.

(b) Static friction coefficient. The average static friction coefficient shall not exceed 0.8."

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* FIGURE 2: Add "and IV" after "class II".

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* FIGURE 3: Add "and IV" after "class II".

NOTE: The margins of this amendment are marked with an asterisk or vertical lines to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

Preparing activity:
Navy - SH
(Project 3130-N003)