

**METRIC**

DOD-G-24508A(NAVY)  
AMENDMENT 3  
12 March 1987  
SUPERSEDING  
DOD-G-24508A(NAVY)  
AMENDMENT 2  
18 September 1986

**MILITARY SPECIFICATION**

**GREASE, HIGH PERFORMANCE, MULTIPURPOSE (METRIC)**

This amendment forms a part of DOD-G-24508A(NAVY), dated 6 May 1977, and is approved for use within the Naval Sea Systems Command, Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

**PAGE 1**

2.1, under "STANDARDS FEDERAL,": Add:

"FED-STD-313 - Material Safety Data Sheets Preparation and the Submission of."

2.1.2: Add as new paragraph:

"2.1.2 Other Government document. The following other Government document forms a part of this specification to the extent specified herein. Unless otherwise specified, the issue shall be the one in effect on the date of the solicitation.

**DEPARTMENT OF LABOR**

Code of Federal Regulations, Title 29, Part 1910,  
Section 1200 - Hazard Communications Standard.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)"

At bottom of page: Delete and substitute beneficial comments statement.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 9150

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PAGE 2

3.1, line 1: Delete "Grease" and substitute "The grease".

3.2: Add as last sentence:

"This grease shall be of such material as to not require additional container labeling in accordance with CFR, Title 29, Part 1910, Section 1200."

3.2.1: Add as new paragraph:

"3.2.1 Toxicity. The multipurpose grease shall have no adverse effect on the health of personnel when used for its intended purpose. The grease shall contain no components which produce noxious vapors in such concentrations as to be an annoyance to personnel during its intended use. Questions pertaining to the toxic effects shall be referred by the contracting activity to the Naval Medical Command (NAVMEDCOM), Washington, DC, who will act as a medical advisor to the procuring activity."

3.2.2: Add as new paragraph:

"3.2.2 Material safety data sheets. The contracting activity and the Naval Sea Systems Command, shall be provided a material safety data sheet (MSDS) at the time of bid submission or contract award. The MSDS is Form OSHA-20 and is found as part of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification."

PAGE 3

3.14: Delete and substitute:

"3.14 Load wear index. The load wear index of the grease shall be not less than 30 kilograms when tested as specified in 4.5.1."

3.19: Delete and substitute:

"3.19 Performance life. The grease shall lubricate a size 315 radial ball bearing satisfactorily at 149°C (300°F) when tested as specified in 4.5.2.1 and compared with Navy Reference Grease Z-1. This test shall be run at David W. Taylor Naval Ship Research and Development Center, Annapolis, MD 21402."

3.20: Delete and substitute:

"3.20 Bearing temperature life rise and grease leakage. The grease, when tested as specified in 4.5.2.2, shall not show a maximum test bearing temperature rise greater than 56°C (100°F) nor a steady-state bearing temperature rise greater than 14°C (25°F) average and no single steady-state temperature rise greater than 17°C (30°F), nor grease leakage greater than 0.1 gram. This test shall be run at David W. Taylor Naval Ship Research and Development Center, Annapolis, MD 21402."

3.25.1, line 1: Delete "4.5.1" and substitute "4.5.4".

3.25.2, line 1: Delete "4.5.4" and substitute "4.5.1".

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PAGE 5

Table I, under "Test" column: Delete "oxidation and tester" and substitute "oxidation tester".

PAGES 5, 6 and 7

4.5.2.1.1 through 4.5.2.1.4.1.4: Delete and substitute the following:

"4.5.2.1.1 Apparatus. The apparatus shall be as shown on figure 1 and shall consist of the following:

- (a) Test spindle supported in a cast iron housing by two auxiliary bearings.
- (b) A 1 hp motor drives the test spindle by means of a flat 2 inch wide belt to give the spindle a speed of  $3600 \pm 50$  revolutions per minute (r/min).
- (c) Electrically heated oven with a temperature controller capable of maintaining the temperature of the test bearing within plus or minus  $1.7^{\circ}\text{C}$  (plus or minus  $3^{\circ}\text{F}$ ) of the chosen temperature. The oven shall have two separate heaters. One heater operates continuously; it is connected to a manually set variable voltage transformer for providing any voltage from 0 to 100 percent of line voltage to this heater. The second heater is connected in series with the temperature controller thus giving intermittent heating with this heater.
- (d) Test bearing; single row, radial, deep groove, single shielded, with pressed steel retainer, size 315, NT3, in accordance with MIL-B-17931, heat stabilized to  $149^{\circ}\text{C}$  ( $300^{\circ}\text{F}$ ), enclosed in a housing and mounted on a vertical test spindle. A radial load of 685.0 newtons (N) (1540 pounds) is applied to the bearing by a spring mounted outside the oven. Details of the bearing housing and its cover shall be as shown on figures 2a and 2b.
- (e) Temperature controller (for heater actuation) maintaining a plus or minus  $1.7^{\circ}\text{C}$  ( $3^{\circ}\text{F}$ ) of set temperature.
- (f) Temperature recorder; to record outer race temperature of test bearing in each test unit.
- (g) Grease gun, hand held, screw type with an applicator tube having a  $3/32$  inch minimum inside diameter.
- (h) Ultrasonic cleaner with heater for cleaning test bearing.
- (i) Balance, top loading, 4000 gram capacity, plus or minus 0.05 gram accuracy.

"4.5.2.1.2 Cleaning material. Dry cleaning solvent, P-D-680 and ASTM D 235, type 4.

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"4.5.2.1.3 Preparation. For pregreased test bearings, remove grease from bearing using narrow blade spatula. All test bearings are then cleaned as follows. The test bearing shall be washed by slowly spinning it while partially submerged in freon. Stubborn deposits or clumps of grease can be worked with a clean brush having short, soft bristles. The grease is removed using P-D-680 and the bearing is rinsed with solvent ASTM D 235, type 4 and dried at 49°C (120°F) in an oven for 1 hour. The bearing is inspected occasionally. The bearing is weighed. Grease is injected into the bearing using the grease gun until  $31 \pm 0.1$  grams of grease having a specific gravity of 0.9 are uniformly distributed throughout the bearing. Grease packs for greases with specific gravity other than 0.9 is as follows:

$$\text{Grease pack (gram)} = \frac{31 \times (\text{specific gravity of grease})}{0.9}$$

Grease shall not extend beyond the face of the races. The bearing shield shall then be installed in the bearing.

"4.5.2.1.4 The bearing shall be placed in the housing and then installed on test spindle so that the bearing shield will be in the down position (see figure 1). Thermocouple wires shall be inserted in the threaded holes provided in the housings so that they are in contact with the bearing outer-ring. The radial load shall then be applied.

"4.5.2.1.5 Procedure. The driving motor shall be started and the bearing operated for 24 hours without heat. Maximum temperature rise over ambient, and temperature rise over ambient at the end of 24 hours shall be noted. Heat shall then be applied to bring the bearing to the specified temperature of  $149 \pm 3^\circ\text{C}$  ( $300 \pm 5^\circ\text{F}$ ) within 1-1/2 hours. The oven heat shall be provided principally by the variable voltage heater with the temperature controller heater acting as a trimming device to maintain the desired test bearing temperature. After 2 hours, bearing outer race temperature shall be checked and the controls for the heaters adjusted so that the heater connected to the temperature controller operates on a cycle of approximately 10 to 25 percent "on" time and 75 to 90 percent "off" time. Thereafter no changes in heater control settings shall be made except for minor adjustments for ambient, voltage changes, and so forth. Test operation shall be cyclic with 6 days (144 hours) running followed by one day (24 hours) shut-down. This operating cycle shall be continued until lubrication failure occurs. During each shut-down, the outside of the bearing housing and oven shall be inspected for grease leakage. Lubrication failure shall be considered to have occurred when any of the following conditions prevail.

- (a) Tripping of motor thermal cut-out switch indicating that frictional torque has increased sufficiently to overload the motor.
- (b) Locking of test bearing or belt slippage (when belt tension is not a factor) on restart or during test run.
- (c) Excessive leakage. Leakage is excessive if grease or separated oil is slung from the bearing or housing.

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- (d) Temperature excursion in excess of 176.7°C (350°F) for more than 24 hours.
- (e) Audible abnormal noise (such as squealing) or vibration while running or perceptible roughness when turning the test bearing by hand.

Once any of these conditions are met, the tester is secured and total running time is recorded. The test shall be conducted on six test bearings. A Weibull plot of the results shall be used to determine the median (50 percent) life. The grease shall be reported as passing if the median life equals or exceeds that obtained in a like test using Navy Reference Grease Z-1. Data on Navy Reference Grease Z-1 shall be no more than 6 months old, otherwise it is to be run at the same time as the candidate grease."

PAGES 6 and 7

Delete footnotes 1, 2, and 3.

PAGES 7 and 8

4.5.2.2 through 4.5.2.2.4.2: Delete and substitute:

"4.5.2.2 Bearing temperature rise and grease leakage test.

"4.5.2.2.1 Apparatus.

- (a) Vertical shaft single test bearing unit with hydraulic loading cylinder for applying a 410 kg (900 pound) thrust load as shown on figure 3. Details of the test bearing spindle and housing are shown on figures 2a and 2b.
- (b) Test bearing; single row, radial, deep groove, single shield with pressed steel retainer, size 315, grade NT3 conforming to MIL-B-17931. A second separable shield or a shield manufactured locally shall be used with each bearing to simulate a double shield bearing configuration in the test. This is attached to the bearing housing above the test bearing (see figure 3). The test bearing shall have a thermocouple located so as to contact the bearing outer diameter at mid-width.
- (c) Motor for driving test spindle, 2.2 kW (3 hp), 3550  $\pm$  50 r/min rated speed. The motor circuit shall incorporate a motor overload breaker which will secure the test when frictional torque has increased sufficiently to overload the motor.
- (d) Removable enclosure around test stand with: (1) heaters mounted below the level of the test bearing maintaining 35  $\pm$  3°C (95  $\pm$  5°F); (2) two fans, one mounted through the wall of the enclosure to vent heat and one mounted inside the enclosure to circulate the air within the enclosure for uniform temperature distribution. The heater and vent fan are wired to a temperature controller so that the heater will operate at temperatures below 35°C (95°F) and the fan will vent excess heat at temperatures above 35°C (95°F).

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- (e) Temperature recorder; to record outer race temperature of the test bearing and ambient (enclosure) temperature.
- (f) Hydraulic power source which with the hydraulic cylinder shown on figure 3 will produce a thrust load of 410 kg (900 pounds) on the test spindle.
- (g) A locally improvised transparent plastic collector basin (with a center hole sufficient to clear the rotating shaft and sides sufficiently high to touch the underside of the mounting plate) shall be supported so as to collect any grease dropping down or thrown outward from the bearing and rotating shaft lower portion.
- (h) Grease gun, hand held, screw type with an applicator tube having a 3/32 inch minimum inside diameter.
- (i) Ultrasonic cleaner with heater for cleaning test bearing.
- (j) Balance, top loading, 4000 gram capacity, plus or minus 0.05 gram accuracy.

"4.5.2.2.2 Cleaning materials. Cleaning compound, solvent, trichlorotrifluoroethane shall be in accordance with MIL-C-81302.

"4.5.2.2.3 Preparation. For greased test bearings, remove grease from bearing using narrow blade spatula. All test bearings are then cleaned as follows. The test bearing shall be washed by slowly spinning it while partially submerged in freon. Stubborn deposits or clumps of grease can be worked with a clean brush having short, soft bristles. The bearing is placed in the ultrasonic cleaner and covered with solvent. The solvent is heated 60°C (140°F) while the ultrasonic cleaner is cleaning the bearing. The bearing is inspected occasionally. When thoroughly clean, the bearing is removed from the ultrasonic cleaner while it is operating. Due to the 60°C (140°F) cleaning temperature, the solvent will flash dry. The bearing is weighed. Grease is injected into the bearing using the grease gun until  $47 \pm 0.1$  grams of grease are uniformly distributed throughout the bearing, based on grease with a specific gravity of 0.9. Greases with different specific gravities, calculate the grease pack using the following:

$$\text{Grease pack (grams)} = \frac{47 \times (\text{specific gravity of grease})}{0.9}$$

Grease shall not extend beyond the face of the races. The bearing shield shall then be installed in the bearing outer race. The bearings shall be installed on the test spindle so the single shield which was in the bearing as supplied is in the downmost position in operation.

"4.5.2.2.4 Procedure. The temperature controller for ambient temperature control is turned on. When the ambient (enclosure) temperature reaches 35°C (95°F) as indicated by the temperature recorder, the circulating fan is turned on. Twenty to 24 hours is allowed for the tester to come to equilibrium temperature. A test load of 410 kg (900 pounds) shall be applied by the load piston and the unit is started. The temperature inside the enclosure is to be maintained at  $35 \pm 3^\circ\text{C}$  ( $95 \pm 5^\circ\text{F}$ ) throughout the test. The test is operated continuously for 20 hours. At the end of the required time, the unit is secured. Appearance of any grease deposited in the plastic collector basin is visually noted with respect to oil separation or change in grease consistency and recorded. Any grease leakage (and oil, if separation occurred) is wiped from the shaft and

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from the interior of the plastic collector basin and weighed. Sufficient disassembly of the apparatus shall be made so grease adhering to exterior test bearing surfaces and adjacent tester areas above and below the upper and lower shields can be collected and weighed.

"4.5.2.2.4.1 Three test runs shall be made on each candidate grease.

"4.5.2.2.4.2 Criteria for evaluating the temperature rise and grease leakage performance of the candidate grease shall be as follows:

- (a) The maximum test bearing temperature rise,  $T(\text{MAX}) - T(\text{AMBIENT})$ , shall not exceed  $56^{\circ}\text{C}$  ( $100^{\circ}\text{F}$ ).
- (b) The mean of the test bearing temperature rise at 20 hours,  $T(20\text{-hours}) - T(\text{AMBIENT})$ , for the three tests shall not exceed  $14^{\circ}\text{C}$  ( $25^{\circ}\text{F}$ ) with no single value greater than  $17^{\circ}\text{C}$  ( $30^{\circ}\text{F}$ ).
- (c) The grease leakage from the test bearing shall not exceed 0.1 gram for any of the three tests. There shall be no grease droppage or slinging into the plastic collecting basin and no indication of oil separation in any test run; any grease leakage from the test bearing shall adhere to the top and bottom bearing shields and bearing and housing areas immediately adjacent to the test bearing."

PAGE 8

Delete footnote 4.

PAGE 10

4.7: Add as new paragraph:

- \* "4.7 Toxicity. To determine conformance to requirements of 3.2.1, the manufacturer of the material shall disclose the formulation of this product to the Naval Medical Command, MEDCOM-242, Washington, DC 20372. The disclosure of proprietary information, which shall be held in confidence by the Naval Medical Command, shall include: the name, formula, and approximate percentage by weight and volume of each ingredient in the product; the results of any toxicological testing of the product; identification of its pyrolysis products; and any such other information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use, disposal, or combustion of the material. Information submitted shall be clearly marked or identified to show it is being provided in connection with qualification under DOD-G-24508."



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6.5, line 1: Delete "Department" and substitute "Laboratory".

6.8: Add as new paragraph:

"6.8 Applicants for qualification may obtain samples of reference grease Z-1 by applying to the Commander, Naval Sea Systems Command, Materials and Assurance Engineering Office, Department of the Navy, Washington, DC 20362-5101."

6.9: Add as new paragraph:

"6.9 Test machinery described in figures 2a and 2b are only available in inch pound units."

6.10: Delete and substitute:

\* "6.10 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets (MSDS) prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in appendix B of FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract."

PAGES 12, 13, 14, and 15

Figures 1a, 1b, 2a, 2b and 3: Delete and substitute attached new figures 1, 2a, 2b, and 3.

LAST PAGE

DD 1426, Standardization Document Improvement Proposal: Delete and substitute address:

"COMMANDER  
NAVAL SEA SYSTEMS COMMAND (SEA 5523)  
DEPARTMENT OF THE NAVY  
WASHINGTON, DC 20362-5101"

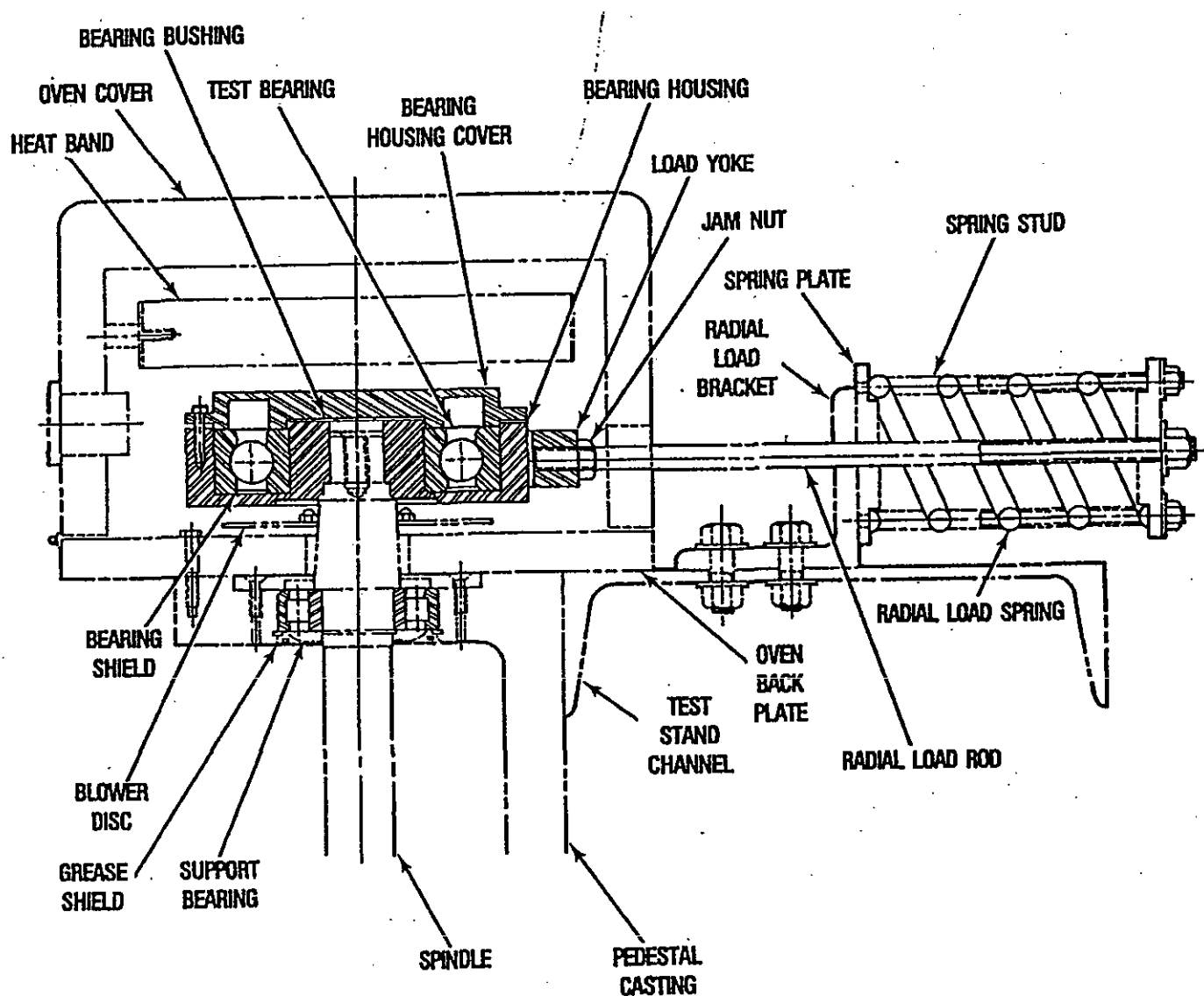
NOTE: The margins of this amendment are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. 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.

Review activity:  
Navy - AS

Preparing activity:  
Navy - SH  
(Project 9150-N806)

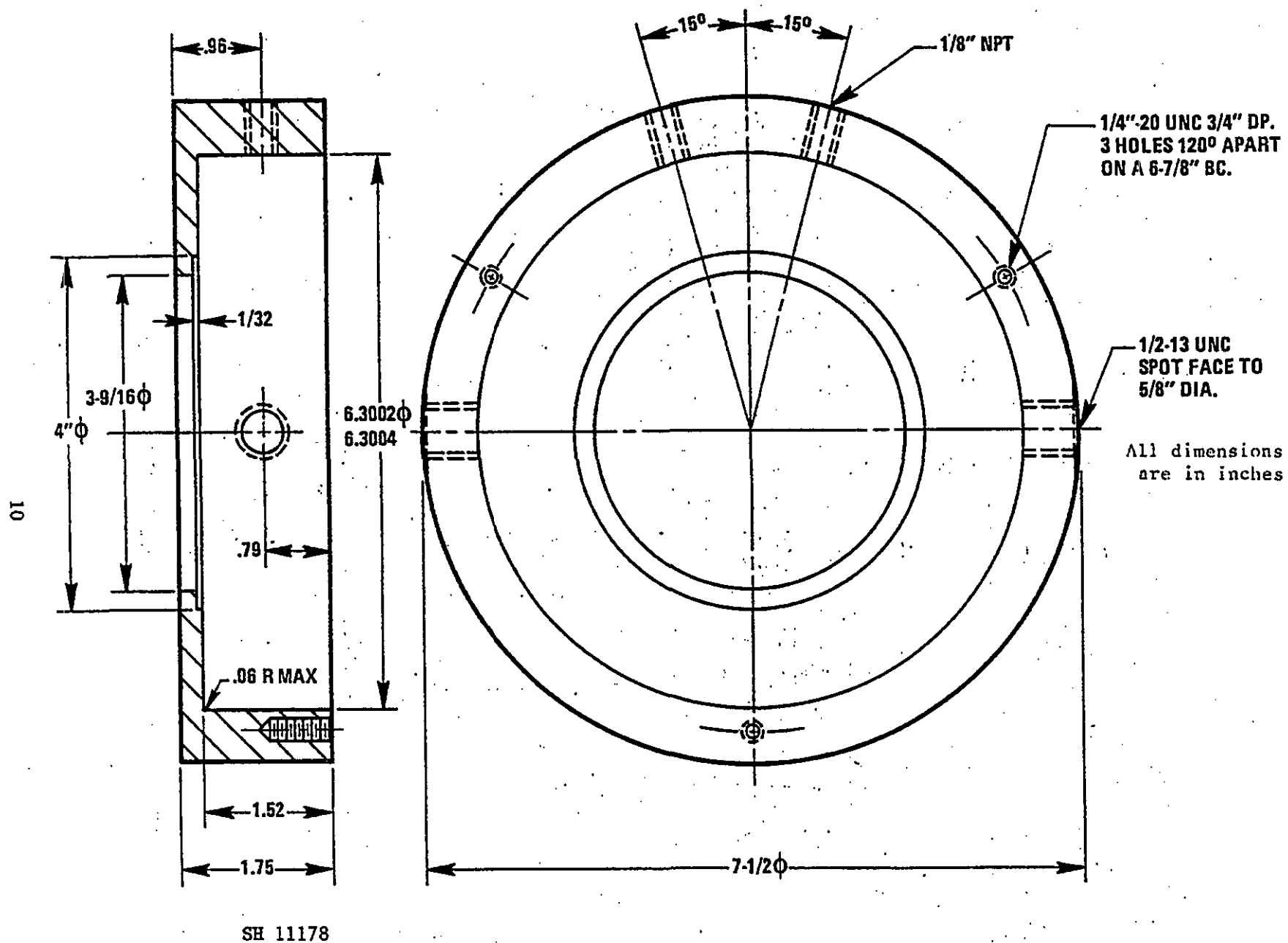


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SH 12113

FIGURE 1. Performance tester assembly for: 315 ball bearing.



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FIGURE 2a. Test bearing housing.

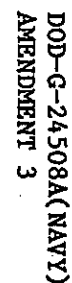


FIGURE 2b. Test bearing cover.

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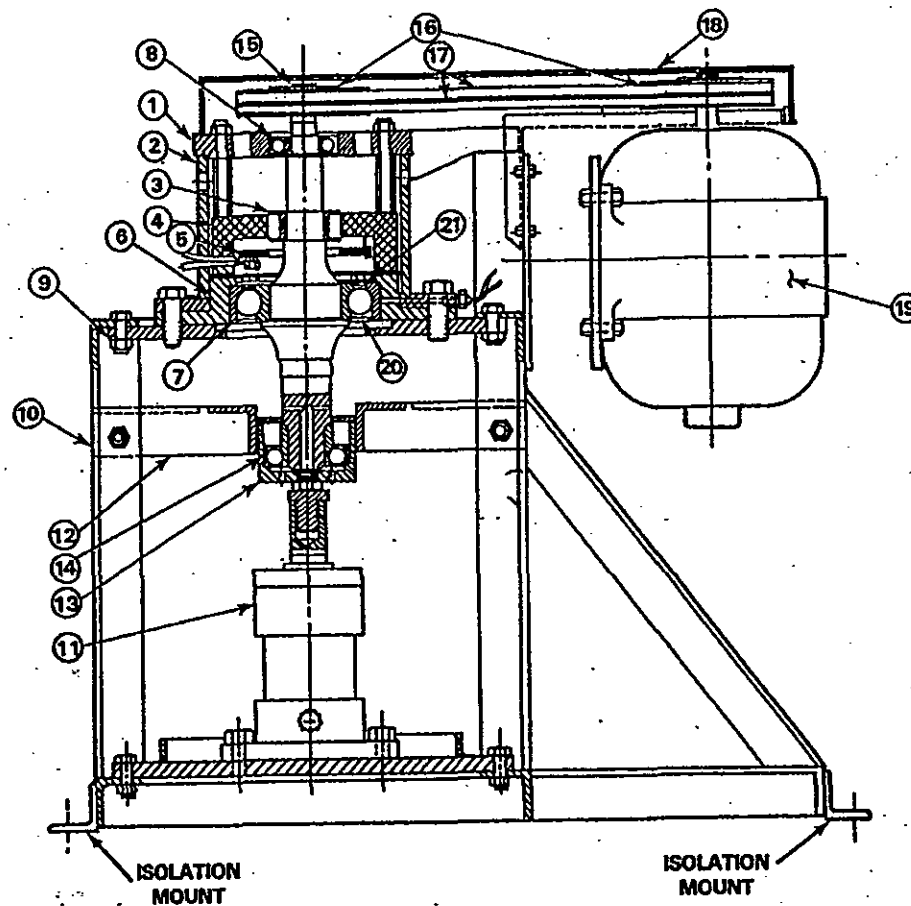


FIGURE 3. Packing and temperature rise vertical spindle.

1. Upper bearing housing.
2. Support housing.
3. Spinner.
4. Heater housing.
5. Heater (not used for temperature rise and leakage test).
6. Test bearing housing.
7. Test bearing.
8. Size 208 "Cartridge" bearing (removable shields).
9. Mounting plate.
10. Frame.
11. Hydraulic cylinder.
12. Torque bracket.
13. Support bearing cup.
14. Size 308 angular contact bearing.
15. Shaft.
16. Drive pulleys.
17. "V" belt.
18. Belt guard.
19. Drive motor (on separate stand).
20. Bearing shield.
21. Fabricated second bearing shield.

Part Identification—Figure 4 temperature rise and leakage apparatus.

SH 11180

FIGURE 3. Packing and temperature rise vertical spindle.