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 SUPERSEDING  
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 (See 6.9)

## MILITARY SPECIFICATION

### BEARINGS, ANTIFRICTION; ASSOCIATED PARTS

### AND SUBASSEMBLIES; PREPARATION FOR DELIVERY OF

This specification is approved for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers the cleaning, drying, preservation-packaging, packing, and marking of stock and production antifriction bearings which do not exceed 16 inches outside diameter (o.d.) or 40 pounds weight. This specification also covers the processing requirements for bearing parts and subassemblies procured as separate items.

1.2 Classification. Preservation-packaging of bearings and bearing parts shall be level A or C, as specified (see 3.3 and 6.1). Level A preservation-packaging shall be in accordance with the following methods and symbols, as specified (see 3.3.1.9 and 6.1):

<u>Method</u>	<u>Symbol</u>	<u>Description</u>
IA-5	C	Rigid metal container; bearing dipcoat preserved or lubricated; wrapped, cushioned, sealed.
IA-6	D	Rigid metal container, single bearing or set immersed in preservative oil.
IA-6	E	Metal drum, bearings immersed in preservative oil (bulk).
IA-6	F	Vials (transparent plastic), bearings, balls or rollers immersed in preservative oil, vial sealed.
IA-8	G	Bearing preserved or lubricated; wrapped; placed in greaseproof, waterproof, water-vaporproof bag; sealed.
IA-13	H	Vials (transparent plastic), bearings, balls or rollers dipcoat preserved or lubricated; wrapped, cushioned, vial sealed.
IA-13	J	Fiber cans; bearings preserved, wrapped, cushioned.
IA-18	K	Multiple compartment plastic, individually sealed (blister pack), bearings dipcoat preserved or lubricated.
IA-19	L	Vacuum formed plastic skin pack, bearings dipcoat preserved or lubricated.
IB-2	A	Bearing dipcoated with preservative, or operating lubricant followed by intimate aluminum wrap, then greaseproof wrapped.
IId	B	Metal drums, bearings wrapped, desiccated (bulk).

#### 2. APPLICABLE DOCUMENTS

2.1 Issues of documents. 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.

Beneficial comments (recommendations, additions, deletions, and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Ship Engineering Center, SEC 6124, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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## SPECIFICATIONS

## FEDERAL

- L-P-377 - Plastic Sheet and Strip, Polyester.
- L-P-378 - Plastic Sheet and Strip, Thin Gauge, Polyolefin.
- P-D-680 - Dry Cleaning Solvent.
- QO-A-1876 - Aluminum Foil.
- TT-C-495 - Coating, Exterior for Tinned Food Cans.
- TT-E-485 - Enamel, Semigloss, Rust-Inhibiting.
- TT-T-291 - Thinner, Paint, Volatile Spirits Petroleum Spirits.
- VV-L-800 - Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature).
- PPP-B-566 - Boxes, Folding Paperboard.
- PPP-B-576 - Box, Wood, Cleated, Veneer, Paper Overlaid.
- PPP-B-585 - Boxes, Wood, Wirebound.
- PPP-B-591 - Boxes, Fiberboard, Wood-Cleated.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple Wall.
- PPP-B-665 - Boxes: Paperboard, Metal Edged and Components.
- PPP-B-676 - Boxes, Setup.
- PPP-B-1055 - Barrier Material, Waterproofed, Flexible.
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
- PPP-F-320 - Fiberboard; Corrugated and Solid, Sheet, Stock (Container Grade), and Cut Shapes.
- PPP-T-60 - Tape: Packaging, Waterproof.
- PPP-T-76 - Tape, Pressure-Sensitive Adhesive Paper, (For Carton Sealing).

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- MIL-P-116 - Preservation-Packaging, Methods of.
- MIL-B-117 - Bags, Sleeves and Tubing; Interior Packaging.
- MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible.
- MIL-P-149 - Plastic Coating Compound, Strippable (Hot Dipping).
- MIL-C-3955 - Cans, Fiber, Spirally Wound.
- MIL-D-6054 - Drum, Metal--Shipping and Storage.
- MIL-L-6085 - Lubricating Oil: Aircraft, Instrument, Low Volatility.
- MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.
- MIL-C-11796 - Corrosion Preventive Compound, Petrolatum, Hot Application.
- MIL-B-13239 - Barrier Material, Waterproofed, Flexible, All Temperatures, Heat Sealable.
- MIL-G-24508 - Grease, High Performance, Ball and Roller Bearing.
- MIL-C-26094 - Can, Hermetic Sealing, Aluminum, Two-Piece.
- MIL-G-81322 - Grease, Aircraft, General Purpose, Wide Temperature Range.
- MIL-B-81705 - Barrier Materials, Flexible, Electrostatic-Free, Heat Sealable.
- MIL-L-81846 - Lubricating Oil, Instrument, Ball Bearing, High Flash Point.
- MIL-G-81937 - Grease, Instrument, Ultra Clean.

## STANDARDS

## FEDERAL

- FED-STD-75 - Glossary of Packaging Terms.
- FED-STD-209 - Clean Room and Work Station Requirements, Controlled Environment.

## MILITARY

- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-147 - Palletized Unit Loads For 40" X 48" Pallets.

(Copies of specifications, standards, drawings, and publications required by contractors 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 on date of invitation for bids or request for proposal shall apply.

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**UNIFORM CLASSIFICATION COMMITTEE**  
**Uniform Freight Classification Rules.**

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, Illinois 60606.)

**NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT**  
**National Motor Freight Classification Rules.**

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., 1616 P Street, N.W., Washington, DC 20036.)

**DEPARTMENT OF TRANSPORTATION**  
**Code of Federal Regulations 37A - Steel Drums Single Trip Container.**

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

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)**  
**MSC C-25 - Precision Packaging Materials Cleanliness, Specification For.**

(Application for copies should be addressed to the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas 77058.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

### **3. REQUIREMENTS**

**3.1 Facilities.** Preservation-packaging facilities shall meet the requirements specified herein. Instrument precision ball bearings shall be packaged by the bearing manufacturer. For other bearings, where the bearing manufacturer does not operate captive facilities in accordance with this specification, contract packaging facilities may be utilized. The bearing manufacturer shall retain ultimate responsibility for acceptability of the bearings.

**3.1.1 Method of transfer.** One of the methods specified in 3.1.1.1 or 3.1.1.2 shall be used when transferring bearings from the manufacturing facility to the contract packaging facility.

**3.1.1.1 Prior to cleaning.** Bearings shall be protected against damage and shipped to the packager allowing for a minimum of storage and transport time. The packager shall perform cleaning, drying, and preservation-packaging operations in accordance with 3.3.

**3.1.1.2 Prior to packaging.** Preserved bearings (see 3.3.1.8) shall be placed individually or in bulk in a clean dust excluding container made of, or lined with, cellulose acetate, nylon, mylar, polyethylene, or other compatible material, protected against damage, corrosion and deterioration, and shipped in a protective container allowing for a minimum of storage and transport time. Intimate wrapping shall be applied in the required packaging area environment.

### **3.2 Materials.**

**3.2.1 General requirements.** Materials used in the cleaning, drying, preservation-packaging, and packing processes shall be as specified herein. Substitutions will not be permitted unless otherwise specified by the command or agency concerned.

**3.2.2 Lubricants and preservative compounds.** The lubricant or preservative compound used shall conform to the item description or technical data applicable to the assigned National stock number (NSN) (or other identification number when an NSN has not been assigned) as specified (see 6.1). When not specified in the contract or order, the lubricant or preservative compound shall be as specified in table I. Fluids shall have been filtered so as to contain no particulate matter greater than 0.45 micrometers for instrument precision ball bearings and 5 micrometers for other bearings. For instrument precision ball bearings, greases shall not be over 1 year old from date of manufacture and shall be passed through a 200 mesh stainless steel screen prior to use. For other than instrument precision ball bearings, greases shall not be over 3 years old from date of manufacture and shall be checked on an annual basis for conformance with applicable specifications. Use of nonconforming greases is prohibited.

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TABLE I. Lubricants and preservative compounds.<sup>1/</sup>

Bearing class (see 6.5.1)	Bearing closure (see 6.5.2)	Lubricant or preservative compound
General purpose	Open	MIL-C-11796, class 3 <sup>2/</sup> or VV-L-800
	Closed	MIL-G-81322, MIL-G-24508
Precision and instrument	Open	MIL-L-6085, MIL-L-81846
	Closed	MIL-G-81322, MIL-G-81937

<sup>1/</sup> For bearings that will tolerate no preservatives due to special application or otherwise (see 3.3.1.9).

<sup>2/</sup> MIL-C-11796, class 3 is recommended in accomplishing methods IA-5, IA-8, and IB-2 for open bearings. Bearings shall cool to ambient temperature before packaging.

3.2.3 Intimate wrapping. A certificate of compliance for material thickness shall be kept on file for 5 years by the facility applying the wrapping.

3.2.3.1 Intimate wrapping for other than instrument precision ball bearings and oxygen equipment bearings. Intimate wrapping materials shall be nylon film (2 mils thick); polyester film (1 mil thick) in accordance with L-P-377, type I; polyethylene film (2 mils thick) in accordance with L-P-378, type I; polyethylene-kraft or cellulose acetate-kraft in accordance with MIL-B-121, grade A. Materials in accordance with MIL-B-121 shall be the type specified in table II. Aluminum foil shall be in accordance with QQ-A-1876 and shall be used with method IB-2 only. Aluminum foil thickness shall be as specified in table II.

TABLE II. Material requirements.

Weight of bearing	MIL-B-121, grade A	QQ-A-1876
	Type	Thickness
(Pounds)		(Inches) (min.)
Up to 5	I or II	0.0015
Over 5	I	0.0020

3.2.3.2 Intimate wrapping for instrument precision ball bearings. Intimate wrapping materials shall be polyethylene film (6 mils thick) in accordance with MIL-B-81705, type II; nylon film (2 mils thick); or fluorocarbon film (2 mils thick) all of which have been cleaned to the requirements of NASA MSC C-25, level II. A certificate of compliance for material cleanliness shall be kept on file for 5 years by the facility applying the wrapping. These films shall have antistatic properties which are a result of compounding.

3.2.3.3 Intimate wrapping for oxygen equipment bearings. Intimate wrapping material shall be fluorocarbon film (2 mils thick).

3.2.4 Metal cans (method IA-5 and IA-6, symbol D). Metal cans shall conform to PPP-C-96, type I as modified in 3.2.4.1, or MIL-C-26094. The nearest can size that will provide minimum weight and cube shall be used. All cans shall be provided with either a scored tear strip lid opening device or a scored key opening band near the top of the can body similar to type I, class 1 or class 2 of PPP-C-96.

3.2.4.1 Cans in accordance with PPP-C-96 shall be fabricated of 0.25 pound electrolytic tin plate with a drawn body or soldered side seam construction. The exterior shall not be pre-coated. Low tin solder may be used. The plate basis weight shall conform to commercial manufacturing standards for the size involved.

3.2.5 Fiber cans (method IA-13, symbol J). Fiber cans shall conform to MIL-C-3955, type I, grade B. The nearest can size that will provide minimum weight and cube shall be used.

3.2.6 Metal drums (method IA-6, symbol E). Metal drums shall conform to MIL-D-6054 or Department of Transportation 37A, except that seaming compounds shall be resistant to the preservatives and lubricants specified and the exterior only of the drum shall be coated with a baked on enamel conforming to TT-E-485, type IV.

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3.2.7 Vials (methods IA-6, symbol F and IA-13, symbol H). Vials shall be constructed of transparent rigid or extruded plastic material (use of polyvinyl chloride (PVC) is prohibited) resistant to the particular lubricant or preservative being utilized. Vial wall thickness shall be 0.030-inch minimum and vial length shall not exceed 10 inches. The size of the vial shall be such as to provide minimum weight and cube, permitting not less than 0.010-inch play between bearings or bearing parts and inside diameter (i.d.) of the vials. For method IA-6, vials shall be closed initially by a secure leakproof closure. For method IA-13, the vial closure seal shall provide a water vapor transmission rate (WVTR) equal to the WVTR of the vial material. Vials shall be designed for reclosure but need not be leak-proof.

3.2.8 Multiple compartment containers individually sealed (method IA-18). Containers shall be constructed of 15 mil thick cellulose acetate butyrate, cellulose acetate, or cellulose propionate. (Use of PVC is prohibited). Material shall be sufficiently transparent to permit ease of reading and identification of bearing marking and visual examination of bearing surfaces. The multiple compartment sheet shall accommodate ten or fewer identical bearings. Figure 1 indicates a multiple compartment container, showing preferred sizes of compartments. In packaging bearings with a height greater than 3/8 inch, the multiple compartment sheet may be doubled over and used for not more than five bearings or another multiple compartment sheet may be used as the top. The i.d. of the smallest dimension of the compartment shall be not less than 0.005 inch greater than the o.d. of the contained bearing. The depth of each individual compartment shall be greater than the thickness of the contained bearing, or if doubled, the combined depth of two compartments shall be greater than the width of the contained bearing. The overall dimensions of the multiple compartment container (length and width) shall be as shown on figure 1. Perforations or tear seals or thinned sections shall be furnished to enable separation when required. Each multiple compartment sheet of bearings shall be unit packaged in accordance with 3.3.1.10.

3.2.9 Vacuum formed plastic skin package (method IA-19). Material used in forming the package shall be either cellulose acetate, cellulose acetate butyrate, or cellulose propionate. (Use of PVC is prohibited). Material shall be sufficiently transparent to permit ease of reading and identification of bearing marking and visual examination of the exterior bearing surfaces. In packaging bearings up to 6 inch o.d. the plastic sheet shall have a minimum thickness of 15 mils prior to forming. The minimum thickness after forming shall be 8 mils single thickness in the o.d., and a minimum of 4 mils in the bore. In packaging bearings with o.d. over 6 inches, the sheet shall have a minimum thickness of 30 mils prior to forming. A certificate of compliance for material thickness prior to forming shall be kept on file by the packaging facility for 5 years. Doughnut packages shall be limited to bearings with bore one inch or larger. Dimpling at bore will be acceptable for all bearings and may be used as an alternate to the doughnut type pack, except that dimpling shall not be permitted between the inner and outer rings of any bearing.

3.3 Cleaning, drying, and preservation-packaging. Cleaning, drying, and preservation-packaging shall be level A or C.

3.3.1 Level A. Sequence of operations shall be such that a minimum of delays occur once the cleaning, drying, and preservation-packaging process is started.

3.3.1.1 Environment and process cleanliness of cleaning and drying areas for other than instrument precision ball bearings. Care in dust control shall be maintained. Presence of dust and dirt producing sources, such as cartons, trash barrels, etc., shall be kept at a minimum. Smoking, eating, and drinking shall not be permitted in the cleaning and drying areas. Cleaning and drying areas are defined as those areas in which bearings are subjected to the cleaning and drying processes, and within a distance of not less than 10 feet in any direction from the equipment including aisles.

3.3.1.2 Environment and process cleanliness of cleaning and drying areas for instrument precision ball bearings. Cleaning and drying areas are defined as those areas in which bearings are subjected to the cleaning and drying processes. Requirements of class 10,000 of FED-STD-209 for particle count shall be met (see 6.7). Relative humidity (r.h.) shall not exceed 45 percent at  $75^{\circ}\text{F} \pm 5^{\circ}\text{F}$ .

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**3.3.1.3 Demagnetization and cleaning.** Prior to cleaning, the magnetization of instrument precision ball bearings shall not exceed a pole strength of 2 gauss and magnetization of all other bearings shall not exceed a pole strength of 5 gauss. Bearings in excess of the applicable value shall be demagnetized. Bearings shall be cleaned in accordance with 3.3.1.3.1 and 3.3.1.3.2.

**3.3.1.3.1 Cleaning of other than instrument precision ball bearings.** Bearings shall be cleaned in accordance with MIL-P-116, process C-5. Agitation tanks and commercial filtration systems shall be used. Petroleum, chlorinated, and fluorinated solvents are permitted for the solvent cleaning. The final step of the cleaning process shall consist of a thorough rinsing in clean solvent conforming to P-D-680 or TT-T-291, grade 1 which has been filtered through a 5 micrometer filter (TT-T-291 shall not be used with corrosion-resisting steels).

**3.3.1.3.2 Cleaning of instrument precision ball bearings.** Bearings shall be cleaned in accordance with MIL-P-116, process C-5. The cleaning process shall include sprays, ultrasonics, and vapor rinsing. The use of chlorinated and fluorinated solvents and acetone is permitted.

NOTE: Solutions used to clean barrier film coated bearings shall be stored separate from solutions used to clean nonbarrier film coated bearings. A barrier film coated bearing shall not be processed through the regular bearing cleaning area.

**3.3.1.4 Drying.** Immediately after cleaning, bearings shall be dried. Slow rotation or oscillation is permitted. Dried bearings to be packaged methods IA-18 and IA-19 which have been processed in the environment of 3.3.1.1 shall be immediately transferred to the preservation-packaging area as they emerge from the dryer.

**3.3.1.4.1 Drying of other than instrument precision ball bearings.** Bearings shall be dried in accordance with MIL-P-116, process D-2 or D-3.

**3.3.1.4.2 Drying of instrument precision ball bearings.** Bearings shall be dried in accordance with MIL-P-116, process C-7 or with warm dry air which has been filtered through a 2 micrometer filter.

**3.3.1.5 Preservation-packaging area environment and process control for instrument precision ball bearings and for packaging methods IA-18 and IA-19.** Preservation-packaging area shall be well illuminated and air conditioned. Requirements of class 10,000 of FED-STD-209 shall be met (see 6.7). The r.h. shall not exceed 45 percent at 75°F + 5°F. The atmosphere within the packaging area shall contain no sulfur dioxide or hydrogen sulfide when tested as specified in 4.6.3.2. As bearings emerge from the dryer, they shall be preserved and transferred to the packaging area in a continuous process.

**3.3.1.5.1 Instrument precision ball bearing intimate wrapping** shall be performed in an environment meeting the requirements of class 100 of FED-STD-209 (see 6.7).

**3.3.1.6 Preservation area environment and process control for other than instrument precision ball bearings and other than packaging methods IA-18 and IA-19.** Area control shall be in accordance with 3.3.1.1. As bearings emerge from the dryer they shall be preserved and transferred to the packaging area in a continuous process. Delays shall be minimized. Any dried bearing awaiting preservation in excess of 1 hour in this environment shall be recleaned. Preserved bearings shall immediately be transferred (after insertion of seals or shields) to the packaging area in clean dust excluding compatible containers.

**3.3.1.7 Packaging area environment for other than instrument precision ball bearings and other than packaging methods IA-18 and IA-19.** Packaging area shall be well illuminated. Requirements of class 100,000 of FED-STD-209 shall be met (see 6.7). The r.h. shall not exceed 45 percent at 75°F + 5°F. The atmosphere shall contain no sulfur dioxide or hydrogen sulfide when tested as specified in 4.6.3.2.

**3.3.1.8 Application of preservative.** Bearings and bearing parts shall be thoroughly coated with the lubricant or preservative compound specified in 3.2.2 unless lubricant or preservative can not be tolerated. Bearing shall be completely immersed in the preservative so as to obtain a continuous coating on all of the bearing surfaces. When an operational lubricant (grease or oil) is specified, the quantity applied shall be specified in the item description or technical data applicable to the assigned NSN (or other identification number when an NSN has not been assigned). When no quantity is specified, it shall be in accordance

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with the manufacturer's standard practice. During or after preservation, the bearing shall be rotated by manual or mechanical (including centrifuging) means to insure complete internal coverage. Grease lubricated bearings shall have external surfaces coated with the specified grease.

**3.3.1.9 Unit protection.** Methods of unit protection shall be in accordance with 3.3.1.9.1 through 3.3.1.9.8. Unless otherwise specified (see 6.1), unit protection for instrument precision ball bearings shall be method IA-8 and for all other bearings shall be in accordance with one of the methods listed in table III for the applicable bearing size. (Where lubricant or preservative cannot be tolerated, unit protection shall be in accordance with method IA-8, IIc or IId of MIL-P-116). Bearings shall be packaged individually, in pairs, or as a set, as applicable. Multiple compartment plastic containers are considered as conforming to this requirement when each individual compartment contains an individual, pair, or set of bearings, as applicable. Unit quantities for bearing parts and for bulk packaging of bearings shall be as specified (see 6.1).

TABLE III. Methods of unit protection.

Size	Open bearings		Closed bearings	
	Method	Symbol	Method	Symbol
Up to and including 1.1811 inches o.d.	IA-8	G	IA-8	G
	IA-6	F	--	--
	IA-13	H	IA-13	H
Over 1.1811 inches but not exceeding 16 inches o.d. <sup>1/</sup>	IA-19	L <sub>2</sub>	IA-19	L
	IA-6	D <sub>2</sub>	IA-5	C
	IA-8	G	IA-8	G

<sup>1/</sup> Method IB-2 may be used for bearings with o.d. over 4.86 inches.

<sup>2/</sup> Bearing weight limited to 1.5 pounds.

**3.3.1.9.1 Method IA-5.** After cleaning and drying, the bearings shall be coated as specified in 3.3.1.8 and wrapped with one of the materials specified in 3.2.3. Wraps shall be made secure either by application of tape conforming to PPP-T-76, heat sealing, or drug store fold as defined in FED-STD-75, followed by insertion into metal cans specified in 3.2.4. Additional dunnage of any of the materials specified in 3.2.3 shall be used to prevent movement of the bearings within the can. Metal cans shall be sealed in accordance with the applicable specifications and shall withstand the tests specified in 4.3.

### 3.3.1.9.2 Method IA-6.

**3.3.1.9.2.1 Method symbol D - rigid metal container.** This method shall not be used when bearing weight exceeds 1.5 pounds. After cleaning and drying, bearings shall be placed in metal containers in accordance with 3.2.4. Each can shall be cleaned with a blast of filtered dry air, by vacuum, or by solvent cleaning before inserting the bearing. Preservative oil in accordance with 3.2.2 shall be added to cover the bearing when lying flat in a normal storage position. However, a minimum air space of 5 percent outage shall be provided. A maximum air space of 50 percent of the can volume shall be permitted when the bearing thickness is more than 50 percent of the inside can height. Cans shall be sealed in accordance with their applicable specifications and shall withstand the tests specified in 4.3. After closing, cans in accordance with PPP-C-96 shall be cleaned, dried, and coated with materials conforming to TT-C-495. Special care shall be taken to coat the undersides of the tear tabs and areas immediately beneath the tear tabs. Unless otherwise specified in the contract or order, painting or coating shall not be required for cans conforming to MIL-C-26094. Separable bearings that measure over 2-1/2 inches o.d. shall have aluminum foil in accordance with QQ-A-1876 placed between each part to prevent brinelling.

**3.3.1.9.2.2 Method symbol E - metal drum (bulk quantities of bearings only).** After cleaning and drying, a quantity of bearings shall be placed in a metal drum as specified in 3.2.6 and fully submerged in preservative oil as specified in 3.2.2. There shall be at least 5 percent outage provided in the drum. Closure shall be effected by a torque of 6 + 1/2 foot-pounds (ft-lbs). Bearings thus preserved, shall not require further over-packing for shipment and the gross weight shall not exceed 70 pounds.

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3.3.1.9.2.3 Method symbol F - vials (transparent plastic). After cleaning and drying, bearings, balls, or rollers shall be placed in a clean, dry, transparent plastic vial specified in 3.2.7. Each vial shall be cleaned with a blast of filtered dry air, by vacuum, or solvent washed before inserting the contents. Preservative oil shall be in accordance with 3.2.2. The vial shall be filled with oil so as to have 5 to 7 percent outage. When vials are not completely filled with bearings, balls, or rollers, clean particle-free compatible plastic or nylon buffer materials shall be used to prevent movement of the contents.

3.3.1.9.3 Method IA-8. After cleaning and drying, the bearings shall be coated as specified in 3.3.1.8 with the materials specified in 3.2.2. Bearings shall then be wrapped or bagged with the material specified in 3.2.3, closure being effected by means of drug store fold or heat sealing. Bearings shall then be placed individually into a water-vaporproof bag in accordance with MIL-B-117, type I, class E. Entrapped air shall be exhausted from the bag by any suitable means but not to the point where undue stress is placed upon the barrier and then the bag shall be heat sealed. Strength of the heat seals shall be as specified in 4.2.2, based upon samples made on production packaging equipment.

#### 3.3.1.9.4 Method IA-13.

3.3.1.9.4.1 Method symbol H - vials (transparent plastic). After cleaning and drying, the bearings, balls, or rollers shall be coated as specified in 3.3.1.8 and wrapped with one of the materials specified in 3.2.3. Wraps shall be made secure either by heat sealing or drug store fold, followed by insertion into vials specified in 3.2.7. Each vial shall have been cleaned with a blast of filtered dry air, by vacuum, or solvent washed before inserting the contents. Additional dunnage of any of the materials specified in 3.2.3 shall be used when necessary to prevent movement of the bearings, balls, or rollers within the vial.

3.3.1.9.4.2 Method symbol J - fiber cans. After cleaning and drying, the bearings shall be coated as specified in 3.3.1.8 and wrapped with one of the materials specified in 3.2.3. Wraps shall be made secure either by application of tape conforming to PPP-T-76, heat sealing, or drug store fold, followed by insertion into the fiber cans specified in 3.2.5. Additional dunnage of any of the materials specified in 3.2.3 shall be used to prevent movement of the bearings within the can. Fiber cans shall be sealed in accordance with the applicable specification and shall withstand the tests specified in 4.3.

3.3.1.9.5 Method IA-18. (This method is no longer recommended for instrument precision ball bearings). After cleaning and drying, each bearing shall be coated as specified in 3.3.1.8 and placed into an individual compartment of the clean and dry plastic container (see 3.2.8). Each container shall be cleaned with a blast of filtered dry air, by vacuum or by solvent rinsing before inserting the bearings. Container shall be completed by sealing each individual compartment. Multiple compartment plastic containers shall be furnished with either perforations or tear seals to enable separation when required. Not more than ten individual compartments shall be contained in a single plastic sheet. Bearings in a single sheet shall be identical. Packaged bearings shall show no evidence of corrosion when tested as specified in 4.5.3.

3.3.1.9.6 Method IA-19. After cleaning and drying, the bearings shall be thoroughly coated as specified in 3.3.1.8 and enclosed in the vacuum formed package as specified in 3.2.9. Plastic sheet shall be cleaned prior to draping over the bearing. Packaged bearing shall show no evidence of corrosion when tested as specified in 4.5.3.

3.3.1.9.6.1 Vacuum forming. Transparent plastic sheet shall be vacuum formed over the bearing. Single seal and single shield bearings shall be oriented with the bearing seal or shield up under the first drape. Bearings with snap rings on the o.d. shall be oriented so that the snap ring is on the side opposite to the final seal.

3.3.1.9.6.2 Sealing. Package shall be sealed at the base edge with a cellulose acetate base in acetone. Flange type seals are not permitted. Seal shall be positive and shall not impair the transparency of the package. Small air bubbles formed in the closing shall not be cause for rejection.

3.3.1.9.6.3 Matched sets. Matched bearing pairs, whose o.d. is 100 millimeters (mm) or less may be placed in the same vacuum formed package. Otherwise, each bearing shall be individually packaged in vacuum formed plastic. Individually packaged bearings comprising a set shall be taped together with transparent pressure-sensitive tape prior to insertion into the unit package, or individual unit packages of a set shall be taped together so markings are not obscured. In the latter case, the unit package shall have the following warning on two sides: "Matched Set, Do Not Separate."

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3.3.1.9.7 Method IB-2. After cleaning and drying, the bearings shall be coated as specified in 3.3.1.8 with the materials listed in 3.2.2. Bearings shall be securely wrapped in aluminum foil as specified in 3.2.3 except that bearings having a bore of 3-1/2 inches or greater, or weighing over 20 pounds, shall be doughnut wrapped. Separable bearing assemblies, or cup and cone combinations that measure over 2-1/2 inches o.d. shall have aluminum foil in accordance with QQ-A-1876 placed between each part to prevent brinelling. Bearings thus treated shall be cooled to room temperature and coated with a strippable compound conforming to type II of MIL-P-149 to a minimum thickness of 0.05 inch, and over-wrapped in a grease-proof barrier material conforming to MIL-B-121, grade A, type optional.

3.3.1.9.8 Method IId (bulk quantities only). Bearings shall be packaged utilizing the drum specified in 3.2.6. Bearings shall be coated as specified in 3.3.1.8 prior to intimately wrapping each bearing with one of the materials specified in 3.2.3. Prior to wrapping, the bearings shall be drained of excess preservative. Bearings shall be secured in place in a manner devised by the contractor. Desiccant shall be used as specified for method II of MIL-P-116 and shall be evenly distributed among the bearings and in no case shall desiccant come in direct contact with the bearing surfaces. Size of the drum shall be minimum, consistent with the quantity and weight of the bearings packed therein. Quantity of bearings shall be such that the gross weight shall not exceed 70 pounds. Additional overpacking is not required.

3.3.1.10 Unit packaging. Bearings, unit protected in accordance with methods IA-8, IA-18, IA-19, and IB-2 shall be individually packaged in a unit container conforming to PPP-B-566, PPP-B-665, or PPP-B-676 for contents not exceeding 5 pounds, and PPP-B-636 or PPP-B-665 for contents in excess of 5 pounds. Method IA-5 units weighing more than 5 pounds shall be individually unit packaged as specified above. Method IA-18 multiple compartment sheets (10 or less bearings) shall be placed one to a unit package as specified above. All other methods shall be construed as being unit packaged when properly identified (see 3.5).

3.3.1.10.1 Closure of unit packages. Unit packages shall be closed as specified in the appendices or notes of the applicable container specifications. When level A packing is specified and PPP-B-636 class weather-resistant or class domestic boxes are not to be intermediate packaged, weather-resistant boxes shall be closed method V and domestic boxes closed method I in accordance with the appendix to PPP-B-636. Vial closures shall be in accordance with 3.2.7.

3.3.1.11 Intermediate packaging. Unless excepted by 3.3.1.11.1, or unless otherwise specified (see 6.1), unit packages shall be intermediate packaged as specified in 3.3.1.11.2 or 3.3.1.11.3, as applicable. Intermediate containers shall provide a snug fit for contents and shall contain identical items only. Gross weight of intermediate packages shall be governed by the applicable container specification or a limit of 20 pounds, whichever is smaller. Unit packages shall be placed in the intermediate containers in an upright position, or a position that will preclude possible brinelling of the packaged bearings. For methods IA-5 (5 pounds or less), IA-6 symbols D and F, and IA-13, fiberboard separators of material conforming to PPP-F-320 shall be provided to separate unit packages both horizontally and vertically. Intermediate packages shall be marked to indicate the top of the container.

3.3.1.11.1 Exceptions. Intermediate packaging shall not be required when any of the following apply:

- (a) Level C packing is required.
- (b) Shipments do not exceed 20 pounds gross weight.
- (c) Packages include a carton conforming to PPP-B-636 as the unit package.

3.3.1.11.2 Intermediate packaging when level A packing is specified. Intermediate packaging shall be accomplished as specified in 3.3.1.11. Containers shall conform to PPP-B-636, type CF or SF, class weather-resistant. Containers shall be closed method V as specified in the appendix of PPP-B-636.

3.3.1.11.2.1 For Army only. Containers shall be closed method IV as specified in the appendix of PPP-B-636.

3.3.1.11.3 Intermediate packaging when level B packing is specified. Intermediate packaging shall be accomplished as specified in 3.3.1.11. Containers shall conform to PPP-B-566, PPP-B-636, type CF or SF (class domestic), PPP-B-665 or PPP-B-676. Container closure shall be in accordance with the applicable specification and appendix thereto.

3.3.1.11.3.1 For Army only. Intermediate containers shall conform to class weather-resistant of PPP-B-636 or PPP-B-665. Closure shall be in accordance with the applicable specification and appendix thereto.

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3.3.2 Level C. Procedures, facilities, and materials for cleaning, drying, and application of preservative or lubricant shall conform to level A requirements (see 3.3.1). Packaging shall afford adequate protection against corrosion, deterioration, and physical damage during shipment from the source to the first domestic receiving activity for immediate use. Unit quantities shall be as specified (see 6.1).

3.4 Packing. Bearings shall be packed level A, B, or C, as specified (see 6.1).

3.4.1 Level A. Except as specified in 3.4.1.1 and 3.4.1.2, packaged bearings shall be packed in containers conforming to the following:

<u>Specification</u>	<u>Type or class</u>
PPP-B-576	Class 2, overseas type
PPP-B-585	Class 3
PPP-B-591	Class II
PPP-B-601	Overseas type
PPP-B-621	Class 2
PPP-B-636	Grade V2s
PPP-B-640	Class 2

Shipping containers to be packed with nonweather-resistant type unit or intermediate packages shall be provided with case liners conforming to, closed, and sealed in accordance with MIL-L-10547. Alternately, wrapping of unit or intermediate packages with PPP-B-1055 or MIL-B-13239 barrier material with all seams sealed with minimum 2-inch wide tape conforming to PPP-T-60 or PPP-T-76 is acceptable in lieu of case liners. Boxes shall be closed, strapped, or banded in accordance with the applicable box specification or appendix thereto, except that PPP-B-636 boxes shall be closed and reinforced method V and PPP-B-640 boxes, style E or F closed and reinforced with nonmetallic strapping or tape in lieu of steel strapping. Unless otherwise specified (see 6.1), the gross weight of wood or wood-cleated boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitation of the applicable box specification.

3.4.1.1 For Army only. Unless otherwise specified (see 6.1), containers conforming to PPP-B-636, PPP-B-640, PPP-B-591, and PPP-B-576 are prohibited as exterior shipping containers under level A.

3.4.1.2 Exception. For bearings packaged method IA-5 (5 pounds or less), IA-6 symbols D and F, and IA-13, where shipments do not exceed 20 pounds gross weight, the shipping container shall conform to PPP-B-636, class weather-resistant. Fiberboard separators, or other devices, of material conforming to PPP-F-320 shall be provided to separate unit packages both horizontally and vertically.

3.4.2 Level B. Except as specified in 3.4.2.1 and 3.4.2.2, bearings shall be packed in containers conforming to one of the following specifications and subsidiary types or classes:

<u>Specification</u>	<u>Type or class</u>
PPP-B-576	Class 2
PPP-B-585	Class 1 or 2
PPP-B-591	Class I
PPP-B-601	Domestic type
PPP-B-621	Class 1
PPP-B-636	Class domestic
PPP-B-640	Class 1

Box closures shall be as specified in the applicable box specification or appendix thereto.

3.4.2.1 Exception. As specified in 3.4.1.2, except the container shall be class domestic.

3.4.2.2 For Army only. Shipping container shall be class weather-resistant.

3.4.3 Level C. Bearings, preserved-packaged as specified (see 3.3), shall be packed in containers acceptable to the common carrier and which will insure safe delivery at the destinations in a satisfactory condition at the lowest applicable rate. Containers or method of packing shall comply with Uniform Freight or National Motor Freight Classification rules or regulations.

3.4.4 Palletization. When specified (see 6.1), shipping containers shall be palletized in accordance with MIL-STD-147 for level A or B shipments.

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3.5 Marking. In addition to the marking required in 3.5.1 through 3.5.4 and in the contract or order (see 6.1 and 6.3), interior (unit and intermediate) packages, exterior shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129 for all levels of preservation-packaging and packing.

3.5.1 Labeling (method IB-2). Method IB-2 packaged bearings shall require a completely marked label placed underneath the strippable plastic dipcoat in addition to the required markings on containers.

3.5.2 Multiple compartment packages (method IA-18). Each compartment in the sheet shall be identified with the NSN and date packaged. Identification may be printed directly onto the plastic or may be applied as a label. The label, if used, shall be compatible with the plastic and shall not be affected by the lubricant or preservative compound. Labels shall be sealed between layers of the plastic.

3.5.3 Vacuum formed skin packages (method IA-19). Marking shall be permanent. It may be printed directly onto the plastic or may be applied as a label. The label, if used, shall be compatible with the plastic and shall not be affected by the lubricant or preservative compound. Labels so printed shall be sealed between layers of the transparent material around the outer circumference of the bearing. If the label obscures more than 50 percent of the outer circumference of the bearing, it shall be of a transparent material. Marking shall consist of the NSN and date packaged.

3.5.4 Precautionary marking. One of the following markings shall appear on one side of each unit and intermediate package, as applicable:

- (a) For level A preservation-packaging of other than barrier film coated and oxygen equipment bearings:  
     PACKAGED . . . . . MIL-B-197F  
     LUBRICATED WITH (SPECIFICATION NUMBER)  
     OR  
     PACKAGED . . . . . MIL-B-197F  
     PRESERVED WITH (SPECIFICATION NUMBER)  
     LUBRICATE PRIOR TO USE
- (b) For level C preservation-packaging of other than barrier film coated and oxygen equipment bearings:  
     PACKAGED . . . . . MIL-B-197F  
     LUBRICATED WITH (SPECIFICATION NUMBER)  
     FOR IMMEDIATE USE  
     OR  
     PACKAGED . . . . . MIL-B-197F  
     PRESERVED WITH (SPECIFICATION NUMBER)  
     LUBRICATE PRIOR TO USE  
     FOR IMMEDIATE USE
- (c) For barrier film coated bearings:  
     PACKAGED . . . . . MIL-B-197F  
     LUBRICATED WITH (SPECIFICATION NUMBER)  
     BARRIER FILM COATED
- (d) For oxygen equipment bearings:  
     PACKAGED . . . . . MIL-B-197F  
     LOX/GOX SYSTEM

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor 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 Sampling for quality conformance inspection.

4.2.1 Lot. A lot shall consist of one day's production or processing of bearings regardless of bearing dimensions subject to the following limitations:

- (a) The same packaging method and cleanliness level.
- (b) Similar ring materials (noncorrosion-resisting steels as one lot, corrosion-resisting steels another).
- (c) Similar lubricants or preservative compounds (hydrocarbon base fluids as one lot, ester base fluids another, silicon another, etc.).
- (d) The same bearing class.

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4.2.2 Sampling for examination, leakage test, heat-sealed seam test, and marking. Sample packages shall be selected at random in accordance with table IV from each lot and subjected to the examinations and tests specified in 4.4 through 4.4.2, and 4.5.1.

4.2.2.1 Acceptance or rejection. For each test, acceptance or rejection of the lot shall be in accordance with table IV. Defects shall be noncumulative.

TABLE IV. Sampling for examination, leakage test, heat-sealed seam test, and marking.

Number of unit packages in lot	Number of packages in sample	Acceptance number	Rejection number
15 and under	3	0	1
16 to 40	5	0	1
41 to 110	7	0	1
111 to 300	10	0	1
301 to 500	15	1	2
501 and over	25	2	3

4.2.3 Sampling for fingerprint corrosion and cleanliness test. Every lot shall be sampled and tested for fingerprint corrosion and cleanliness in accordance with 4.5.2. Samples shall be one of the following:

- (a) Five panels fabricated of the same material as the outer bearing race and having the same surface finish as the outer bearing race.
- (b) Five bearings or outer bearing races selected at random which are classified as "scrap" or "reject", but whose surfaces are adequate for the purpose of this test.

4.2.3.1 Acceptance or rejection. Failure to pass the test of 4.5.2 shall be cause for rejection of the lot represented by the failed sample(s). All items shall be rejected until necessary corrections have been made and tests have proven satisfactory compliance. The lot shall then be recleaned, resampled, and retested.

4.2.4 Sampling for corrosion test (methods IA-18 and IA-19). Two packages prepared by the same production procedures as the packages being offered for acceptance shall be selected at random as often as necessary for the test of 4.5.3. Material contained in the packages may be as specified in 4.2.3 (b), if desired; otherwise, material shall be the same as that being offered for acceptance. This shall be a continuous test and packages shall be examined daily. A new set of test packages shall be placed under test every week (168 hours), unless a failure is noted prior to the end of the 168-hour period. If a failure (any corrosion) is noted prior to the end of the 168-hour period, a new package, or packages, as applicable, shall be placed under test immediately and packaging by the method represented by the failure shall be stopped. All items packaged by the method represented, which have not already been shipped, shall be rejected. After the correction of procedural deficiencies, the rejected material shall be reprocessed, repackaged, resampled, and retested. This test is for process control only and shall not affect material already shipped.

4.3 Quality conformance inspection. Quality conformance inspection shall be conducted at the contractor's plant under the supervision of the Government quality assurance representative. The quality conformance inspection shall consist of the inspection specified in table V.

TABLE V. Quality conformance inspection applicable to each method of unit protection.

Inspection	Method IA-5	Method IA-6	Method IB-2	Method IId	Method IA-18 IA-19	Method IA-8	Method IA-13
Visual and dimensional examination (see 4.4)	X	X <sup>1/</sup>	X	X	X	X	X
Leakage test (see 4.5.1)	X	X <sup>1/</sup>	-	X	-	X	X
Fingerprint corrosion and cleanliness test (see 4.5.2)	X	X	X	X	X	X	X
Heat-sealed seam test (see 4.5.1)	-	-	-	-	-	X	-
Corrosion (see 4.5.3)	-	-	-	-	X	-	-
Marking examination (see 4.4.2)	X	X	X	X	X	X	X

<sup>1/</sup> The leakage test will not be required for bearings packaged in bulk quantities.

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4.4 Examination. Each of the sample packages selected in accordance with 4.2.2 shall be visually and dimensionally examined to verify compliance with the requirements of this specification listed in table VI, as applicable.

TABLE VI. Examination.

Examination	Requirement paragraph
Cans have tear strip or scored key lid	3.2.4
Material for methods IA-18 and IA-19 is transparent	3.2.8 and 3.2.9
Thickness after draw for method IA-19 meets specified minimum	3.2.9
Magnetism of bearing does not exceed specified level	3.3.1.3
Coating of lubricant or preservative is continuous	3.3.1.8
Package conforms to specified method	3.3.1.9
Dunnage is sufficient to prevent bearing movement	3.3.1.9.1, 3.3.1.9.2.3, and 3.3.1.9.4
Oil filled containers have specified outage	3.3.1.9.2
Strippable coating meets specified minimum thickness	3.3.1.9.7

4.4.1 Visual examination under magnification. When specified (see 6.1), instrument precision ball bearings packaged in transparent materials shall be visually examined under a 10x scope through the package for contamination within the bearing or the package prior to shipment.

4.4.2 Marking examination. Unit, intermediate, and exterior packages, and packing shall be examined to determine compliance with the marking requirements specified in 3.5 through 3.5.4.

#### 4.5 Test methods.

4.5.1 Leakage and heat-sealed seam tests. The leakage and heat-sealed seam test shall be in accordance with MIL-P-116.

4.5.2 Fingerprint corrosion and cleanliness test. Sample specimens shall be cleaned and dried in accordance with 3.3.1.3 and 3.3.1.4 along with the production lot. The test shall be performed by suspending the samples in the air over the water in a static humidity chamber at 75°F + 5°F for 24 hours. If no corrosion is seen without visual aid at the conclusion of the test, satisfactory cleanliness has been achieved.

4.5.3 Corrosion test. Packaged bearings, selected in accordance with 4.2.4, shall be exposed for one week (168 hours) at 90 percent plus or minus 5 percent r.h. at 120°F + 5°F in a humidity cabinet.

4.6 Facilities inspection. Facilities inspections conducted under the supervision of the Government quality assurance representative shall be in accordance with 4.6.1 through 4.6.2.3.

4.6.1 Inspection. A facilities inspection shall be conducted daily to verify compliance with the requirements of this specification not involving tests, as follows:

- (a) Preserved bearings are being transferred from an uncontrolled environment to a controlled environment in dust excluding containers (see 3.3.1.6).
- (b) Oil and grease lubricants are being filtered prior to use (see 3.2.2).
- (c) Grease in use is not overage (see 3.2.2).
- (d) Packaging materials are being stored in clean areas and are being cleaned prior to use (see 3.3.1.9.2.1, 3.3.1.9.2.3, 3.3.1.9.4.1, and 3.3.1.9.5).
- (e) Care in dust control in uncontrolled cleaning, drying, and preservation areas is exercised. No smoking, eating, and drinking is enforced and dirt producing sources are minimized (see 3.3.1.1 and 3.3.1.6).
- (f) Exposure of cleaned and dried bearings to the uncontrolled atmosphere is minimized (see 3.3.1.6).
- (g) Washing machines are maintained and solvents are filtered to promote a clean bearing (see 3.3.1.3.1 and 3.3.1.3.2).
- (h) Clean room discipline is maintained (see 6.7).

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#### 4.6.2 Sampling of the atmosphere in work rooms.

4.6.2.1 Sampling for temperature, humidity, and airborne particle count. Daily records shall be maintained by the packaging facility indicating the r.h., temperature, and particle count for work rooms in accordance with 3.3.1.2, 3.3.1.5 and 3.3.1.7. Applicable work rooms shall be tested in accordance with 4.6.3.1 semi-annually by a laboratory satisfactory to the Government quality assurance representative to determine conformance with these requirements. The report shall be filed with the cognizant Government quality assurance representative and shall be made available to the procuring activity on request.

4.6.2.2 Sampling for industrial gases. The test of 4.6.3.2 shall be performed semi-annually to determine conformance with the requirements of 3.3.1.5 and 3.3.1.7. The test shall be conducted by a laboratory satisfactory to the Government quality assurance representative. The report shall be filed with the cognizant Government quality assurance representative and shall be made available to the procuring activity on request.

4.6.2.3 Equipment calibration. Equipment used to control, monitor, and record clean room and work station conditions shall be calibrated annually.

#### 4.6.3 Environment and process cleanliness tests.

4.6.3.1 Packaging room environment test (airborne particle counting methods). This test shall be conducted in accordance with FED-STD-209.

4.6.3.2 Packaging room environment test (sulfur dioxide (SO<sub>2</sub>) and hydrogen sulfide (H<sub>2</sub>S) gases). Samples of the packaging room air shall be collected and submitted to colorimetric Rosaniline (Fuchsin) procedure or equivalent method (see 6.8). Prior to sampling, the air from the packaging room shall be run through the sample container for a minimum of 10 minutes before closing the petcock valve. No sulfur dioxide or hydrogen sulfide shall be present.

### 5. PREPARATION FOR DELIVERY

5.1 This section is not applicable to this specification.

### 6. NOTES

6.1 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Level of preservation-packaging required (see 1.2).
- (c) The following are applicable to level A preservation-packaging only:
  - (1) Method and symbol of preservation-packaging required (see 1.2 and 3.3.1.9).
  - (2) Lubricant or preservative compound required (see 3.2.2).
  - (3) Intermediate packaging not required (see 3.3.1.11).
  - (4) Visual examination under magnification required (see 4.4.1).
- (d) Quantity of bearings, parts, or subassemblies per unit or bulk container (see 3.3.1.9 and 3.3.2).
- (e) Requirements applicable to the Department of the Army only (see 3.3.1.11.2.1, 3.3.1.11.3.1, 3.4.1.1 and 3.4.2.2).
- (f) Level of packing required (see 3.4).
- (g) Weight exception (see 3.4.1).
- (h) If palletization is required (see 3.4.4).
- (i) Marking required (see 3.5 and 6.3).

6.2 Cleaning the exterior of the bearing package before opening. This note is directed particularly toward instrument precision ball bearings, although it can apply generally to all types. After the bearing has left the manufacturer's plant, or the packaging facility, properly packaged under clean room conditions, the exterior of the package may become dirty. Containers and packages frequently generate small amounts of static electricity which attracts dirt and dust particles, and contamination adheres to the package. Particularly for instrument precision ball bearings, control should be established to clean the exterior parts of the package before entry into the processing area. A recommended method is to have the package blasted with absolutely clean dry air or remove static electricity charge with a solvent such as Freon TF. Once entering the processing area and placed in a laminar flow hood, the package should be washed again with Freon TF solvent for approximately 5 to 10 seconds to remove exterior contaminant before being placed in a clean container ready to be cut open. The package should be opened carefully so that there will be no chips of the packaging material generated and the bearing should be removed with stainless steel tweezers, or suitable handling tools. Bearings should never be handled with bare hands or fingers.

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6.3 It is not intended that the procuring activity deviate from MIL-STD-129 and thus impose additional requirements on the contractor. However, special occasions arise which will require some "special" requirements. For example, bearings may be procured for a special project. Such bearings would require marking showing the project designation.

6.4 Cleaning is a most important part of bearing preservation. It is essential that the cleaning method not leave residues which either may react unfavorably with the preservative, lubricant, or packaging material, or may be unstable and decompose to form corrosive residues.

#### 6.5 Definitions.

6.5.1 Bearing class. For classification purposes of this specification bearing classes are defined in accordance with 6.5.1.1 through 6.5.1.3.

6.5.1.1 General purpose bearings. General purpose bearings are bearings manufactured to less than precision bearing tolerances (see 6.5.1.2).

6.5.1.2 Precision bearings. Precision bearings are bearings manufactured to, or better than, the following AFBMA tolerances:

- (a) ABEC5 and RBEC5 for metric ball and roller bearings.
- (b) ABEC5P for instrument ball bearings.
- (c) ABEC5T for torque tube and extra thin type bearings.
- (d) Class 3 for inch tapered roller bearings.

6.5.1.3 Instrument bearings. Instrument bearings are bearings with outside diameters not over 1.1811 inches.

6.5.2 Bearing closure. Bearing closure is defined in accordance with 6.5.2.1 and 6.5.2.2.

6.5.2.1 Open bearings. Open bearings are those having a single shield, or those having no seals or shields, or those that are separable.

6.5.2.2 Closed bearings. Closed bearings are those having either seals, shields, bands, or retainment plates, or other devices completely closing both sides of bearings, or a single contact seal on one side only, rendering cleaning and relubrication difficult.

6.6 When bearings are procured by equipment contractors for subsequent delivery to the Government as spares, proof of conformance to the provisions of this specification by the bearing manufacturer including the environment and process cleanliness provisions of 4.6 may serve as the basis for Government acceptance.

6.7 The information contained in the appendix of FED-STD-209 should be utilized to the fullest in the achievement and maintenance of the air cleanliness classes required herein for clean rooms and work stations.

6.8 References to Rosaniline (Fuchsin) method of test (see 4.6.3.2). The following documents are recommended for the above references:

- (a) Standard Methods of Chemical Analysis, 6th Edition 1963, Van Nostrand, Volume 2, part A, page 631.
- (b) Colorimetric Determination of Nonmetals, D.F. Boltz Interscience Publishers, N.Y.
- (c) Handbook of Analytical Chemistry, McGraw Hill, N.Y., Boltz & Schenk.
- (d) Colorimetric Methods of Analysis, F.D. and C.T. Snell, Van Nostrand.
- (e) Encyclopedia of Chemistry, 1957 and 1958 Supplement, Chemical Colorimetry, page 736.

6.9 Changes from previous issue. The symbol "#" is not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

#### Custodians:

Army - WC  
Navy - SH  
Air Force - 99

#### Review activities:

Army - AT, SM, WC  
Navy - AS, OS, SA, SH, YD  
Air Force - 99  
DSA - IS

#### User activities:

Navy - MC

#### Preparing activity:

Navy - SH  
(Project PACK-0483)

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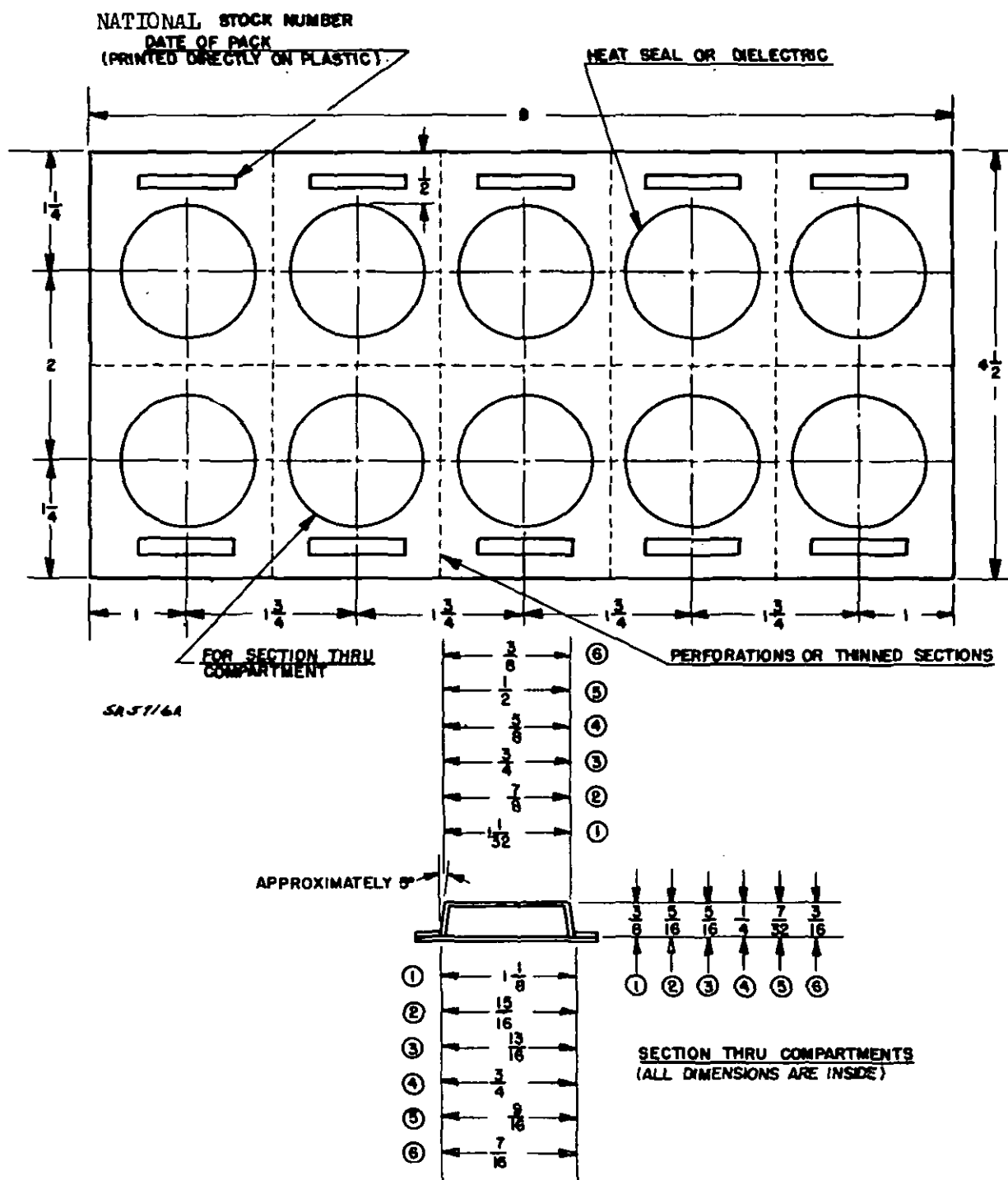


FIGURE 1. Multiple compartment containers  
individually sealed (method 1A-18).

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