

Gasket, Metallic-Encased

RATIONALE

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1. SCOPE AND CLASSIFICATION:

1.1 SCOPE:

This specification covers metallic-encased gaskets with and without inlays.

1.2 Classification:

Gaskets shall be of the following types and styles (see 6.2):

1.2.1 Type: The type of gaskets shall consist of the following:

II - Metallic with cork core.

III - Metallic with asbestos-free fiber core.

NOTE: Type I (Metallic with asbestos core) has been deleted and replaced by Type III. Asbestos has been banned by the Government.

1.2.2 Style: The style of gaskets shall be designated by the following:

A - Single jacket

B - Double end

D - French inner

E - French 2 piece

F - French 3 piece

G - Double jacketed

H - Overlapped jacket

I - French narrow

J - Annular

2. APPLICABLE DOCUMENTS:

The following publications, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

PPP-B-601 Boxes, Wood, Cleated Plywood

PPP-B-621 Boxes, Wood, Nailed and Lock-Corner

FED-STD-123 Marking for Shipment (Civil Agencies)

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129 Marking for Shipment and Storage
MIL-STD-1190 Minimum Guidelines for Level C Preservation, Packing and Marking
MIL-STD-2073-1 DOD Standard Practice for Military Packaging

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D471 Rubber Property - Effect of Liquids
ASTM D1974 Fiberboard Boxes, Methods of Closing, Sealing, and Reinforcing
ASTM D3951 Practice for Commercial Packaging
ASTM F147 Flexibility of Gasket Materials Containing Asbestos or Cork
ASTM F495 Weight Loss of Gasket Materials Upon Exposure to Elevated Temperature

3. REQUIREMENTS:

3.1 Materials:

3.1.1 Jacket: Unless otherwise specified (see 6.2), the jacket material, for all types and styles, shall be made of commercial annealed copper, not less than 0.007 (0.18 mm) or more than 0.015 inch (0.38 mm) in thickness.

3.1.2 Core:

3.1.2.1 Type II: The core for type II gaskets shall be made by compressing and bonding uniformly granulated cork free from hardback and dust. The binder used to bond the cork shall be natural cork gum or other suitable binder.

3.1.2.2 Type III: The core for type III gaskets shall be composed of an asbestos-free fiber with filler, bound together with a suitable binder. The asbestos-free material shall contain largely inorganic substances and minimal organic material.

3.1.3 Recycled material: The material offered shall contain recovered materials to the maximum extent possible. Recovered materials are defined as material which has been collected or recovered from solid waste. Solid waste is defined as any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from community activities. Excluded are solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or specific industrial discharges.

3.2 Commercial product:

Except as otherwise specified herein, the metallic gasket shall be a standard product of the manufacturer or his supplier. The items furnished shall be new and unused.

3.3 Design and fabrication:

The configuration of the metallic gaskets shall be similar to styles A through J as shown in figures 1 and 2. The design of the gaskets not detailed herein shall be based on temperature and pressure of the system. Type III suitable for use in a temperature range of 150° to 500°F (66° to 260°C) and pressures up to 200 pounds per square inch (psi) 1.379 MPa). Type II is suitable for use in a system where temperature goes up to 150°F (66°C) and pressure up to 200 psi (1.379 MPa).

3.4 Dimensions:

3.4.1 Shapes, sizes, and openings: The shapes, sizes, openings, and bolt hole locations of the finished gasket shall be as specified (see 6.2).

3.4.2 Thickness: The thickness of the gasket denoted by E on figures 1 and 2 shall be as specified (see 6.2) or in conformance with the appropriate military standard.

3.4.3 Tolerances: The tolerances shall be shown in table 1.

TABLE I. Tolerances

	Gasket outside perimeter							
	25 in. (635 mm) or less				Over 25 in. (635 mm)			
	Plus		Minus		Plus		Minus	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
Thickness	1/64	(0.39)	1/64	(0.39)	1/32	(0.79)	1/64	(0.39)
Inside diameter	1/64	(0.39)	0		1/32	(0.79)	0	
Outside diameter	0		1/64	(0.39)	0		1/32	(0.79)
Width	0		1/64	(0.39)	0		1/32	(0.79)

3.5 Ignition loss, for type III:

The loss in weight of the asbestos-free filler core of type III gaskets on ignition shall not be more than 30 percent when tested in accordance with 4.4.1.1.

3.6 Core, type II:

3.6.1 Resistance to boiling water: The cork of type II gaskets shall not expand more than 2 percent in any of its linear dimensions or disintegrate when tested in accordance with 4.4.2.

3.6.2 Resistance to oil: The cork core of type II gaskets shall show no evidence of disintegration when tested in accordance with 4.4.3.

3.6.3 Resistance to fuel: The cork core of type II gaskets shall show no evidence of disintegration when tested in accordance with 4.4.4.

3.6.4 Dimensional change: The cork core of type II gaskets shall not shrink more than 0.5 percent when tested in accordance with 4.4.5.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

- 4.1.1 Responsibility for compliance: All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Sampling:

- 4.2.1 Lot: For the purpose of sampling, a lot shall consist of all gaskets, of the same type, style, and thickness, produced essentially under the same conditions, and offered to the Government at one time.
- 4.2.2 Sampling for examinations: A random sample of gaskets shall be selected from each lot offered for examination in accordance with MIL-STD-105, inspection level II. The acceptance quality level (AQL) shall be 2.5 percent defective for major defects.
- 4.2.3 Sampling for tests:
- 4.2.3.1 Type II gaskets: Unless otherwise specified (see 6.2) sufficient core material, used in type II gaskets, shall be submitted with the lot to perform the tests specified in 4.4.2, 4.4.3, 4.4.4 and 4.4.5.
- 4.2.3.2 Type III gaskets: A random sample of type I and type III gaskets shall be selected in accordance with inspection level S-3 of MIL-STD-105.

4.3 Examination:

Each sample selected in accordance with 4.2.2 shall be examined to verify conformance with this specification. Samples shall be examined for the defects listed in table II. Any gasket sample containing one or more defects shall be rejected.

TABLE II. Classification of defects

Category	Defects
<u>Major</u>	
101	Material not as specified.
102	Construction not as specified.
103	Filler not as specified.
104	Shape and size not as specified.
105	Thickness of metal jacket not as specified.

4.3.1 Inspection conditions: Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in applicable test method document or applicable paragraphs in the specification.

4.4 Tests:

4.4.1 Ignition loss on type III gaskets: Ignition loss test on type III core material shall be conducted at $600 \pm 16^\circ\text{F}$ ($316 \pm 9^\circ\text{C}$) for 60 ± 5 minutes in accordance with method specified in ASTM F495.

4.4.2 Resistance to boiling water: The linear dimension of a specimen of the cork core from type II gaskets approximately 6 inches (152 mm) long and other dimensions as received shall be measured to the nearest 0.01 inch (0.25 mm). The specimens shall be immersed in boiling water for $3 \pm 1/4$ hour, removed, permitted to cool for 10 minutes, immediately measured, and examined for disintegration.

$$\text{Expansion, percent} = \frac{A - B}{B} \times 100$$

Where:

A = dimension in inches after immersion

B = the same dimension before immersion

Two specimens shall be tested. The average of the results obtained from the two specimens shall be the expansion of the sample.

4.4.3 Resistance to ASTM Oil No. 1: Type II core material, sampled in accordance with 4.2.3.2, shall be immersed in ASTM Oil No. 1 for 70 hours at $212 \pm 5^\circ\text{F}$ ($100^\circ \pm 3^\circ\text{C}$) in accordance with test procedure in ASTM D471. At the end of the immersion period, the sample shall be removed from the oil and cooled for 10 minutes at room temperature. The sample shall then be flexed in accordance with procedure specified in ASTM F147. Any signs of cracking, breaking or separation shall be cause for rejection.

4.4.4 Resistance to ASTM Fuel C: A sample of type II core material, approximately 1 inch (25.4 cm) by 2 inches (50.8 cm), shall be immersed in ASTM Fuel C of ASTM D471 for 10 days at $73^\circ \pm 5^\circ\text{F}$ ($23^\circ \pm 3^\circ\text{C}$). The container for conducting the test should be equipped with a reflux condenser to reduce evaporation. Any immersion fuel lost through evaporation should be replaced in order to make sure the sample is completely covered during the test. At the end of the immersion period, the sample shall be examined for any signs of disintegration.

- 4.4.5 Dimensional change: A specimen of the cork core from type II gaskets approximately 6 inches (152 mm) long with other dimensions as received shall be conditioned for 24 hours in an atmosphere of 50 to 65 percent relative humidity and at a temperature of $73^{\circ} \pm 5^{\circ}\text{F}$ ($23^{\circ} \pm 3^{\circ}\text{C}$). At the end of the conditioning period, the specimen shall be measured to the nearest 0.005 inch (0.127 mm) brought to a temperature of $131^{\circ} \pm 9^{\circ}\text{F}$ ($55^{\circ} \pm 5^{\circ}\text{C}$), and maintained at this temperature for a period of 24 hours. At the end of the heating period the specimen shall be conditioned for 24 hours in the above atmosphere and again measured.

$$\text{Shrinkage, percent} = \frac{A - B}{A} \times 100$$

Where:

A = original dimension after conditioning

B = same dimension after heating and conditioning

Two specimens shall be tested. The average of the results obtained from the two specimens shall be the shrinkage of the sample.

4.5 Packaging, inspection:

The inspection of the preservation-packaging and interior package marking shall be in accordance with the group A and B quality conformance inspection requirements of MIL-STD-2073-1. The inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification and the marking requirements of MIL-STD-129.

5. PACKAGING:

(The preparation for delivery requirements specified herein apply only for direct Government procurements. For the extent of applicability of the preparation for delivery requirements of reference documents listed in section 2.)

5.1 Preservation:

Preservation shall be level A, C or Commercial as specified (see 6.2).

- 5.1.1 Level A: Level preservation shall be in accordance with Method 31 of MIL-STD-2073-1 (preservative not required).

- 5.1.2 Level C for Army use: Level C preservation shall be accomplished in accordance with MIL-STD-1190.

- 5.1.3 Commercial: Commercial preservation of gaskets shall be in accordance with ASTM D3951.

5.2 Packing:

Packing shall be level A, B, C, or commercial, as specified (see 6.2).

- 5.2.1 Level A: The gaskets, packaged as specified in 5.1, shall be packed in suitable wood containers conforming to PPP-B-601 or PPP-B-621.
- 5.2.2 Level B: The gaskets, packaged as specified in 5.1, shall be packed in fiberboard boxes conforming to ASTM D1974.
- 5.2.3 Level C for Army use: Level C shall be accomplished in accordance with MIL-STD-1190.
- 5.2.4 Commercial: The gaskets shall be packed in accordance with ASTM D3951.
- 5.3 Marking:
- 5.3.1 Level A, B, and C: In addition to any special marking required by the contract (see 6.2), each unit and intermediate pack, exterior container and unitized load shall be marked in accordance with MIL-STD-129. When specified (see 6.2), the marking of domestic shipment for Federal Civil agencies, shall be in accordance with FED-STD-123.
- 5.3.2 Commercial: Commercial marking shall be in accordance with ASTM D3951.
6. NOTES:
- (This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)
- 6.1 Intended use:
- 6.1.1 Type III: Gaskets covered by this specification are intended for use in exhaust systems of internal-combustion engines, air compressors, and other connections subject to temperatures of 150° to 500°F (66° to 260°C) and pressures up to 200 psi (1.379 MPa).
- 6.1.2 Type II: Gaskets covered by this specification are intended for use in fuel, water, and air connections of internal combustion engines subject to pressures up to 200 psi (1.379 MPa) and temperatures up to 150°F (66°C).
- 6.2 Ordering data:
- Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:
- Title, number, and date of this specification.
 - Type and style of gasket required (see 1.2).
 - If different jacket material is required (see 3.1.1).
 - Shape, size, openings and bolt hole locations required (see 3.4.1).
 - Thickness of gasket required (see 3.4.2).
 - If different amount of core material is required for testing type II gaskets (see 4.2.3.1).
 - Level of preservation and packing required (see 5.1 and 5.2).
 - Marking requirements (see 5.3).