

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-P-5516

REV. A

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Superseding AMS-P-5516

Packing, Preformed, Petroleum Hydraulic
Fluid Resistant, 160°F

RATIONALE

AMS-P-5516 is a word for word conversion of the old military spec. It is no longer used and contains many erroneous requirements such as military QPL and test procedures (ASTM) that have been cancelled. This document is not usable in its present form and there is no reason to revise it, since there is no usage.

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This document has been taken directly from U.S. Military Specification MIL-P-5516C and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-P-5516C. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Any material relating to qualified product lists has not been adopted by SAE. This material was part of the original military specification and is reprinted here for historic reference only.

1. SCOPE:

1.1 This specification covers two classes of preformed packings for use where resistance to hydraulic fluid conforming to specification MIL-H-5606 is required at temperatures from -65° to 160°F.

1.2 Classification:

Packings shall be made from the following classes of synthetic rubber as specified (see 6.2).

Class A - Low Flexibility

Class B - High Flexibility

2. APPLICABLE DOCUMENTS:

The following publications, of the issues in effect on the 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.

MIL-P-4861	Packing, Preformed, Rubber, Packing, Packaging of
MIL-H-5440	Hydraulic Systems, Aircraft Types I and V, Design Installation, and Data Requirements For
MIL-P-5514	Packing, Installation and Gland Design, Hydraulic, General Requirements For
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
MIL-H-6083	Hydraulic Fluid, Petroleum Base Preservative
MIL-S-18729	Steel Plate, Sheet, and Strip, Alloy, 4130, Aircraft Quality
MIL-STD-10	Surface Roughness, Waviness, and Lay
MIL-STD-831	Test Reports, Preparation of
MS 24690	Packing, Preformed, High Pressure Air Valve
MS 28772	Packing, O-Ring, Shock Strut
QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
QQ-B-626	Brass, Leaded and Nonleaded: Rods, Shapes, Forgings, and Flat Products with Finished Edges (Bar, Flat Wire and Strip)
QQ-B-750	Bronze, Phosphor, Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections
FED-STD-601	Rubber: Sampling and Testing
FED-STD-791	Lubricants, Liquid Fuels, and Related Products; Methods of Testing

2.1 (Continued):

AN6225	Packing: V-Ring Hydraulic
AN6227	Packing: O-Ring Hydraulic
AN6228	Adapter: V-Ring Female Hydraulic Packing
AN6229	Adapter: V-Ring, Male, Hydraulic Packing
AN6230	Gasket: O-Ring Hydraulic
AN6238	Gasket: Replaceable Reservoir Type Filter Element
ANA Bulletin No. 438	Age Controls for Synthetic Rubber Parts

2.2 ASTM Publications:

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

ASTM D 91	Method of Test for Precipitation Number of Lubricating Oils
ASTM D 1329	Tentative Method of Test for Evaluating Low Temperature Characteristics of Rubber and Rubber-Like Materials by a Temperature-Retracton Procedure (TR Test)

3. REQUIREMENTS:

3.1 Qualification:

The packings furnished under this specification shall be a product which has been tested, and passed the qualification tests specified herein and has been listed on or approved for listing on the applicable qualified products list.

3.2 Material:

The packings shall be manufactured from a synthetic rubber which is compatible with hydraulic fluid conforming to specification MIL-H-5606. The synthetic rubber shall contain no substances which will adversely affect the properties of the fluid or the packings.

3.3 Design and construction:

3.3.1 Dimensions: Dimensions and tolerances shall be as specified on AN6225, AN6227, AN6229, AN6230, AN6238, MS24690, and MS 28772 or in the contract (see 6.2).

3.3.2 Splicing: Splicing of cured rubber shall not be used in the manufacture of the packings. Splicing of uncured stock is allowable.

3.4 Physical properties:

Physical properties of the synthetic rubber shall conform to Table I.

- 3.4.1 The maximum permissible variations in original physical properties during actual production from those values established during qualification tests shall be within the limits specified in Table II, but must stay within the limits specified in Table I.

3.5 Finish:

Mold flash shall be removed from the packings in such a manner that they conform to the requirements specified herein and on applicable standards. All surfaces of the packings shall be reasonably free from defects, blemishes, or irregularities. Reasonable shall be defined as allowing minor pits, raised spots, or tool marks which shall not be greater than 0.003 inch in height or depth from the packing surface.

3.6 Performance:

- 3.6.1 Leakage and breakout: Packings shall not exceed specified values when tested as described in section 4. There shall be no evidence of wear, extrusion, disintegration, or excessive permanent set.
- 3.6.2 Cycling: Packings shall withstand the operations specified in section 4. Leakage shall not exceed values specified in section 4. After test, the packings shall be serviceable with no evidence of cracking, flaking, excessive wear, or other malfunctioning.
- 3.6.3 Fatigue: All o-ring type packings when tested in section 4 shall perform without fatigue failure.

TABLE I. - Original physical properties

Property	Class A	Class B
Specific gravity	As determined ¹	As determined ¹
Hardness at 24° ± 3° C.(75° ± 5°F) shore A durometer, minimum	88	68
Tensile strength, psi	As determined	As determined ¹
Elongation, ultimate, percent	As determined	As determined ¹
Tensile stress (modulus), psi at 100 percent elongation	Not required	As determined ¹
Permanent set, percent	As determined at 50 percent elongation	Not greater than 4 percent at 150 percent elongation
Temperature retraction, 50 percent elongation and 10 percent return		As determined ¹
Tear resistance of AN6227-28 O-rings, minimum of 2 pounds		As determined ¹
Permissible change in original physical properties after oil and air aging		
Tensile strength, change percent	As determined	As determined ²
Elongation change, percent	As determined	As determined ²
Hardness change, points, Shore	As determined	As determined

TABLE I. - Original physical properties (Continued)

Property	Class A	Class B
A durometer	(See 4.5.2)	(See 4.5.2)
Permanent set (list actual value)	As determined	As determined ²
Volumetric change upon aging in hydraulic oil, percent ²	0 to +5 percent ²	0 to +10 percent for O-ring ²
Corrosion adhesion	None ²	None ²
Temperature retraction 50 percent elongation and 10 percent return		-45 F or lower ²

¹Tests are to be made on AN6227 or AN62230 O-rings or AN6225 V-rings, as applicable. All other tests are to be performed on platen sheets or hardness samples, as applicable. (Hardness shall not be determined from actual packing rings).

²Tests are to be made on AN6227 or AN6230 O-rings, and on AN6225 V-rings, as applicable.

TABLE II. Maximum production permissible variations in physical properties from contractors' qualification values (see service approval report for limiting production values for a given compound)

Property	Class A	Class B
Specific gravity, points	± 0.02 ¹	± 0.02 ¹
Hardness, shore A durometer	± 3 ²	± 3 ²
at 24° ± 3°C. (75° ± 5°F), points		
Tensile strength, percent	±15	±15
Elongation, percent	±20	±20
Modulus, pounds, percent	Not required	±25
Permanent set, percent	±20	±20
Temperature retraction 50 percent elongation and 10 percent return.		±3°F
Corrosion and adhesion	Slight corrosion on steel	Slight corrosion on steel
Volume change	Swell determined from Qualification test value ±2 (see example, ³ but must stay within limits specified in Table I.	

¹If basic specific gravity is 1.30, then limits can be 1.28 to 1.32.

²Shore hardness on production samples shall be not less than 85 for class A material, nor 65 for class B material with this tolerance applied.

³Example: If qualification swell of O-ring is +1 percent, then limits can be 0 to 3 percent; if +5 percent, then limits can be 3 to 7 percent; or if +8 percent, then limits can be 6 to 10 percent.

3.6.4 Crush: Class B materials shall be capable of withstanding high compressive loads without cracking, or otherwise disintegration, when tested in accordance with section 4.

3.7 Identification of Product:

The following general marking shall be used.

3.7.1 O-ring packings shall be identified in relation to the manufacturer and in conformance to this specification by a proper label on the package.

TABLE III. - Test samples required for Qualification tests
Physical Property Test

Tests	AN6225 V-ring		AN6227 O-ring		
	-20	-25	-19	-23	-28
Unaged samples (table I):					
Specific gravity	Use untested rings listed below for this test				
Tensile strength and elongation				3	3
Tensile stress (modulus)				2	2
Permanent set			2		
Temperature retraction 50/10				1	
Tear resistance of O-ring packings					2
Corrosion and adhesion	5		5		
Air-aged (table I):					
Tensile strength and elongation				3	3
Permanent set			2		
Oil-aged (table I):					
Tensile strength and elongation				3	3
Permanent set			2		
Temperature retraction 50/10				2	
Volumetric change	6	6		6	6
Subtotal (physicals)	11	6	11	20	19

Performance and Endurance Tests

Endurance (unaged)	2	4	1	3	2
Performance and endurance (aged)	4	4	2	4	2
Fatigue (new, air, and oil-aged)			6	6	6
Crush test (new, air, and oil-aged)			12		
Subtotal (Performance)	6	8	21	13	10
Additional samples required by Federal Test Method Standard No. 601.			18	18	18
Total (all tests)	17	14	50	51	47

- 3.7.2 V-ring packings shall have the manufacturer's trademark and the applicable size dash number molded into the surface of the inner Vee close to the apex of the angle. If any other marking is used, it shall be specially approved by the procuring activity. If raised figures are used, the height shall not exceed 0.010 inch.

3.8 Age:

Unless otherwise specified the age limitations for the finished product shall conform to ANA Bulletin No. 438.

3.9 Workmanship:

Workmanship and finish shall be in accordance with the highest grade practice in manufacturing this kind of product. Manufacturing practices shall be such that the physical properties of the finished product shall be uniform through the cross section of the packing.

- 3.9.1 O-ring packings may be off-register due to mold misalignment to the limit of the ring dimensions still being within specified tolerances, and ring finish being as specified.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of tests:

The inspection and testing of packings shall be as follows:

- a. Qualification tests (see 4.3).
- b. Acceptance tests (see 4.4).

4.3 Qualification tests.

- 4.3.1 Sampling instructions: The Qualification test samples shall consist of the following:

- a. Class A material
 - 17 AN6225-20
 - 14 AN6225-25
 - 3 Platen press sheets (0.075" x at least 4 3/4" x 4 3/4")
 - 3 ASTM hardness test disks, 1/4 inch thick by 1 inch diameter

4.3.1 (Continued):

b. Class B material

50 AN 6227-19

51 AN6227-23

47 AN6227-28

3 ASTM hardness test disks, 1/4 inch thick by 1 inch diameter

- 4.3.1.1 Platen press sheets and discs shall have the same compounding and equivalent cure as the accompanying packings, and the packings shall represent the manufacturer's production product, particularly with respect to stock preparation, mold design and finish, and molding technique. Proper identification shall be applied to each packing using expected production marking compound and technique and color.

4.3.2 Tests: The qualification tests shall consist of all the following tests:

Class A

- | | |
|--|--------------------------|
| (a) Examination of product | (4.4.1) |
| (b) Specific gravity (new only) | (4.5.1.6) |
| (c) Shore durometer hardness (new, air and oil aged) | (4.5.1.1) |
| (d) Tensile strength (new, air and oil aged) | (4.5.1.2) |
| (e) Ultimate elongation (new, air and oil aged) | (4.5.1.2) |
| (f) Permanent set (new, air and oil aged) | (4.5.1.2 and
4.5.1.4) |
| (g) Corrosion and adhesion (new only) | (4.5.4) |
| (h) Volume change (oil aged only) | (4.5.2.2) |
| (i) High and low temperature performance | (4.5.5.1 and
4.5.5.2) |
| (j) Endurance cycling tests | (4.5.6.1 and
4.5.6.2) |