MIL S-82496A
30 April 1977
Superseding
MIL-S-82496(OS)
27 May 1968

MILITARY SPECIFICATION

SCREWS, MACHINE, SELF-SEALING, INTEGRAL O-RING

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 requirements for the procurement of integral O-ring, self-sealing machine screws including self-locking screws referred to herein as assembled screws.

1.2 Classification. Integral O-ring, self-sealing machine screws shall be of the following type, styles and compositions (see 6.2):

Type I. - Panhead
Style 1. - Cross-recessed
Style 2. - Slotted
Composition A. - Silicone rubber O-ring
Composition B. - Fluorosilicone rubber O-ring

1.2.1 Sizes. Screws shall be classified by nominal size or basic screw diameter as specified in ANSI B18.6.3 - 1972.

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 the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel
QQ-S-763	Steel Bars, Wire, Shapes and Forgings, Corrosion Resisting

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Ordnance Station (611) Indian Head, MD 20640 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 5305

TT-S-735	Standard Test Fluids; Hydrocarbon
ZZ-R-765	Rubber, Silicone
PPP-H-1581	Hardware (Fasteners and Related Items) Packaging and Packing for Shipment and Storage of

MILITARY

MIL-H-5606	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-F-18240	Fasteners, Externally Threaded, 250°F, Self-Locking Element For
MIL-R-25988	Rubber, Fluorosilicone Elastomer, Oil- and Fuel-Resistant, Sheets, Strips, Molded Parts, and Extruded Shapes

STANDARDS

FEDERAL

FED-STD-66	Steel: Chemical Composition and Hardenability

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MS3212	Screws, Machine, Pan Head, Cross-Recessed, Self-Sealing, Integral Silicone O-Ring, Plain and Self-Locking
MS3213	Screws, Machine, Pan Head, Cross-Recessed, Self-Sealing, Integral Fluorosilicone O-Ring, Plain and Self-Locking
MS15981	Fasteners, Externally Threaded, Self-Locking Design and Usage Limitations for

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring acticity 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 the date of the invitation for bids or the request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B18.6.3 - 1972	Machine Screws and Machine Screw Nuts

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A493-74	Stainless and Heat-Resisting Steel for Cold Heading and Cold Forging-Bar and Wire
ASTM A581-74	Free-Machining Stainless and Heat-Resisting Steel Wire
ASTM A582-75	Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

NATIONAL BUREAU OF STANDARDS (NBS)

Handbook H28	Screw-Thread Standards for the Federal Service

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

(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 Preproduction sample. Unless otherwise specified in the contract (see 6.2), a preproduction sample of the assembled screws is required and shall be manufactured using the methods and procedures proposed for production. The sample shall be tested as specified in Section 4 for the purpose of determining that, prior to starting production, the contractor's production methods are capable of producing assembled screws that comply with the technical requirements of this specification (see 4.4.1).

3.2 Design and construction. The screws shall have an annular recess in the underside of the head designed to retain a molded elastomer sealing O-ring as an integral part of the assembled screw in accordance with the applicable MS sheet (MS 3212, MS 3213) or drawing (see 6.4).

3.3 Materials.

3.3.1 Screw. Materials for screws shall be in accordance with 3.3.1.1 or 3.3.1.2. The material compositon shall be within the check analysis tolerances for standard stainless and heat resisting steels in accordance with FED-STD-66. The minimum ultimate tensile strength shall be 75,000 psi.

3.3.1.1 Corrosion-resisting steel (CRES). Unless otherwise specified in the contract (see 6.2), CRES screws shall be manufactured from material conforming to Class 304, 305 or 316 of QQ-S-763, or type 304, 305, 316, 384 or XM-7 of ASTM A 493-74.

3.3.1.2 Non-magnetic steel. When specified in the contract (see 6.2), screws shall be manufactured from non-magnetic steel conforming to Class 302, condition A or B of QQ-S-763; Type 302, annealed of ASTM A 493-74; Type 303, condition A or B of ASTM A 581-74 or Type 303, condition A of ASTM A 582-75.

3.3.2 O-ring. Sealing O-rings shall be composition A or B as specified in the contract (see 6.2).

3.3.2.1 Composition A. Composition A sealing O-rings shall be Grade 60 silicone rubber in accordance with Class 2a or 2b of ZZ-R-765; and shall be resistant to Type IV petroleum base oil of TT-S-735.

3.3.2.2 Composition B. Composition B sealing O-rings shall be Grade 60 fluorosilicone rubber in accordance with Type I, Class 1 of MIL-R-25988 and shall be resistant to MIL-H-5606 hydraulic fluid and Type III fuel of TT-S-735.

3.3.3 Self-locking element. When self-locking screws are specified in the contract (see 6.2), the self-locking element shall be a non-metallic element in accordance with MIL-F-18240 and MS 15981.

3.4 Dimensions and Tolerances. Unless otherwise specified on the applicable MS sheet or Drawing (see 6.2), dimensions and tolerances of the screws after finishing shall be in accordance with ANSI B18.6.3 - 1972.

3.5 Threads. Threads shall be in accordance with NBS Handbook H28, Class 2A, UNC or UNF series, as specified in the contract (see 6.2).

3.6 Head recess.

3.6.1 Cross-recessed. The style 1, cross-recessed head design shall be in accordance with the dimensions of Type I cross-recessed pan head machine screws of ANSI B18.6.3 - 1972.

3.6.2 Slotted. The style 2, slotted head design shall be in accordance with the dimensions of slotted pan head machine screws of ANSI B18.6.3 - 1972.

3.7 Protective finish. The screws shall be passivated in accordance with QQ-P-35, prior to assembly with O-rings.

3.8 Performance. Assembled screws shall be capable of sealing when subjected to 1000 pounds per square inch gage (psig) internal or external operating pressure for fifteen tightening cycles and shall maintain a seal when subjected to an internal or external proof pressure of 1500 psig for 60 ± 5 seconds.

3.9 Workmanship. The assembled screws shall be uniform in quality and shall be free from irregularities, flashing, burrs or slivers which could adversely affect safety or performance.

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 Classification of inspection. The inspection requirements specified herein are classified as follows:

a. Preproduction inspection (see 4.5)
b. Quality conformance inspection (see 4.6)

4.3 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed under the following conditions:

a. Temperature: Room ambient 18 to 35°C (65 to 95°F)
b. Altitude: Normal ground
c. Vibration: None
d. Humidity: Room ambient to 95 percent relative, maximum

4.4 Sampling.

4.4.1 Preproduction sample. Unless otherwise specified in the contract (see 6.2), a preproduction sample of 12 of each size assembled screw to be supplied on contract or order, manufactured in accordance with 3.1, shall be subjected to the preproduction inspection detailed in 4.5 at an activity designated by the procuring activity (6.2). Acceptance of the preproduction sample shall be based on no defects in the sample. Further production of the screws by the contractor prior to approval of the preproduction sample shall be at the contractor's risk.

4.4.2 Lot size. A lot shall consist of assembled screws of the same Type, Style, Composition, and Size, produced under essentially the same conditions, by the same process, by one manufacturer, at one plant, and to be offered for acceptance at one time.

4.4.3 Quality conformance inspection sampling.

4.4.3.1 Sampling for examination and test. A random sample of assembled screws shall be taken from each lot in accordance with inspection level S-1 of MIL-STD-105, and subjected to the quality conformance inspection of 4.6.

4.4.3.2 Sampling for packaging examination. Sampling for packaging examination shall be in accordance with PPP-H-1581.

4.5 Preproduction inspection. The preproduction sample shall be subjected to the inspection of 4.6 with the exception of 4.6.1. After having satisfactorily passed the quality conformance inspection the sample shall be subjected to the tests of 4.5.1 and 4.5.2. Acceptance of the preproduction sample shall be based on no defects.

4.5.1 Operating pressure test. The preproduction sample assembled screws shall be installed in the test fixture plates in accordance with Figure 1 to the torque values specified in Table I. For Composition A O-rings, one plate with six assembled screws shall be immersed in Type IV petroleum base oil of TT-S-735. For Composition B O-rings, one plate with six assembled screws shall be immersed in hydraulic fluid per MIL-H-5606 and one plate shall be immersed in Type III fuel of TT-S-735. In each case the plates with assembled screws installed shall be conditioned in the appropriate fluid for 70 hours at 93.5 ± 1°C (200 ± 2°F) then allowed to return to room temperature before testing. Immediately upon removal from the fluid bath the plates shall be mounted in the test fixture in accordance with Figure 1 with screw heads exposed to the appropriate test fluid. All external surfaces of the plate shall be dried and the test fixture pressurized to 1000 ± 50 psig for five minutes. Leakage about any screw thread shall result in rejection of the preproduction sample. The pressure shall be released and the plates inverted and reinstalled on the fixture. The external plate surfaces shall be dried and the fixture again pressurized to 1000 psig for five minutes. Leakage about any screw head shall result in rejection of the preproduction sample.

TABLE I. Installation Torque.

Nominal Screw Size	Installation Torque (in. - lbs.)
(#4) .112-40 UNC -2A	5
(#6) .138-32 UNC -2A	9
(#8) .164-32 UNC -2A	20
(#10) .190-32 UNF -2A	23
(#10) .190-24 UNC -2A	23
(1/4) .250-20 UNC -2A	75

4.5.2 Endurance test. The preproduction sample assembled screws used in 4.5.1 shall be released and retightened to the torque values of Table I fourteen additional times. The test of 4.5.1 shall be repeated after the fifth, tenth and fifteenth tightening cycles.

4.6 Quality conformance inspection. The quality conformance inspection shall consist of the following examinations and tests. The acceptable quality levels (AQL) shall be in accordance with Table III. Failure of any sample to comply with the requirements of this specification shall result in the rejection of the lot represented by the sample.

4.6.1 Visual and dimensional examination. Each sample assembled screw shall be visually examined to verify conformance with this specification. Classification of defects shall be in accordance with Table III. Any sample assembled screw having one or more defects shall be removed from the lot.

4.6.2 Packaging examination. Examination of packaging to verify conformance with Section 5 shall be in accordance with PPP-H-1581.

TABLE II. Installation Clearance Holes.

Nominal Screw Size		Max Clearance Holes (inches)
(#4)	.112	.128
(#6)	.138	.149
(#8)	.164	.177
(#10)	.190	.201
(1/4)	.250	.266

NOTE: Do not chamfer clearance holes. Break sharp edges 0.062 inch max.

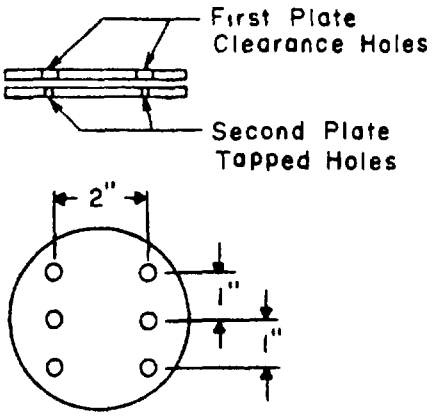
4.6.3 Proof pressure test. Each sample assembled screw shall be installed in test fixture plates in accordance with Figure 1 to the applicable torque value specified in Table I. The plates shall be assembled on the test fixture with screw heads outward and the test fixture pressurized to 1500 ± 50 psig for 60 ± 5 seconds. All external plate surfaces shall be dry prior to test. TT-S-735, Type IV, petroleum base oil shall be used as the test fluid for assembled screws with Composition A O-rings and MIL-H-5606 hydraulic fluid or TT-S-735, Type III fuel as the test fluid for assembled screws with Composition B O-rings. Any screw showing leakage around the head shall be counted as a defective screw.

4.6.4 Self-locking element. Self-locking screws shall be tested in accordance with the quality conformance inspection of MIL-F-18240 to verify conformance of the self-locking element with 3.3.3.

5. PACKAGING.

5.1 Preservation and packaging. Preservation and packaging shall be level A or C in accordance with PPP-H-1581 as specified in the contract or order (see 6.2).

5.2 Packing. Packing shall be level A, B or C in accordance with PPP-H-1581 as specified in the contract or order (see 6.2).



Test Fixture Plates

Drill first steel plate to maximum clearance shown in Tab II. Tap second plate for test screw sizes to maximum of Clas: 2B fit per ANSI B18.6.3 - 1972 Bolt and gasket plates to test fixture suitable for 1600 psig maximum pressure.

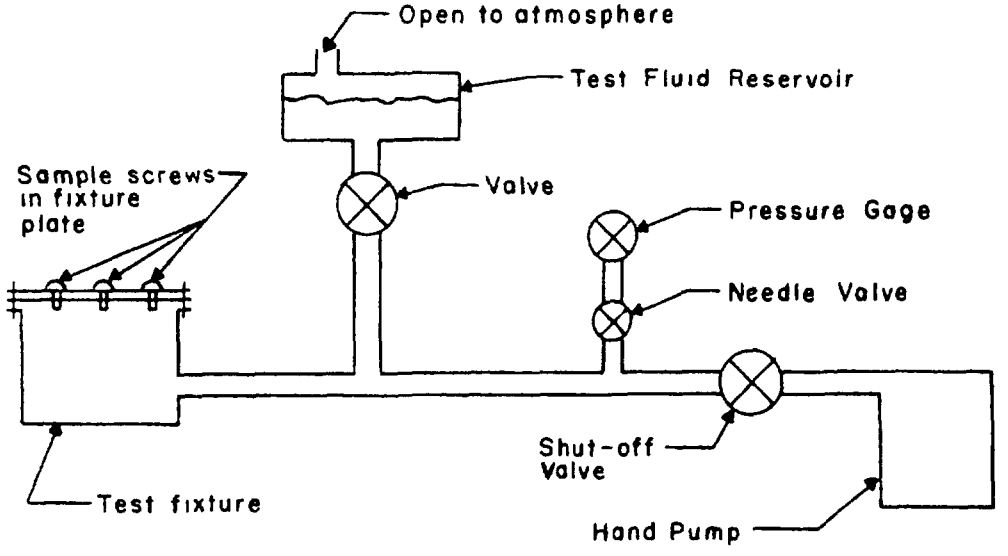


FIGURE I. Test Fixture.

TABLE III. Classification of defects.

Categories	Defects	Methods
Critical	None defined	
Major	AQL - 2.5 percent defective	
101	Screw sizes	SIE[1]
102	Screw lengths	SIE
103	Thread series and class	SIE
104	Slot dimensions	SIE
105	Recess dimensions	Gages[2]
106	Sealing O-ring missing	Visual
107	O-ring groove in head missing	Visual
108	Passivation omitted	Visual
109	Proof pressure	4.6.3
110	Self-locking element missing or not in accordance with MIL-F-18240	4.6.4
Minor	AQL - 4.0 percent defective	
201	Thread length	SIE[1]
202	Points	SIE
203	Eccentricity of head	SIE
204	Eccentricity of slot	SIE
205	Eccentricity of recess	SIE

1 Standard inspection equipment

2 Recesses shall be gaged in accordance with Appendix III of ANSI B18.6.3 - 1972 for penetration gaging of recessed heads.

5.3 Marking. In addition to any special markings required by the contract or order (see 6.2), unit packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES AND CONCLUDING MATERIAL.

6.1 Intended use. Integral O-ring, self-sealing, corrosion resistant machine screws are intended for use in assembling machined parts so as to provide a leakproof seal against some oils and fresh or salt water at temperatures to 93.5°C (200°F) and pressures to 1000 psig.

6.2 Ordering data. Procurement documents should specify the following:

6.2.1 Procurement requirements.

a. Title, number and date of this specification.
b. Type, Style and Composition required (see 1.2, 3.3.2 and 3.6).
c. Size and quantity required (see 1.2.1).
d. When non-magnetic steel is required (see 3.3.1.2).
e. When self-locking screws are required (see 3.3.3).
f. Class and series of threads required (see 3.5).
g. MS or drawing part number, when applicable (3.4).
h. When a preproduction sample is not required (see 3.1, 4.4.1 and 6.3).
i. Assigned activity for preproduction inspection (see 4.4.1).
k. Required level of packaging and packing (see 5.1 and 5.2).
l. Any special markings required (see 5.3).
j. Inspection conditions other than as specified (see 4.3).

6.2.2 Contract data requirements. Any data required for delivery in connection with this document shall be specified on a DD Form 1423 incorporated into the contract. Such data will be delivered as identified on completed (numbered) DIDs (Data Item Descriptions/DD 1664) which will be documented in the Applicable ADL (Authorized Data List).

6.3 Preproduction sample waiver. Preproduction samples submitted and approved on a recent contract may be accepted by the procuring activity in lieu of an additional preproduction sample inspection. When the preproduction sample is waived (see 6.2.1.h), the procurement document should contain a statement specifying that the standards of workmanship exhibited by the previously approved preproduction sample shall determine the minimum requirements of the current contract or order.

6.4 Installed screws. Upon installation the O-ring seal is completely contained within the groove in the head of the screw. Full compression of the O-ring seal is accomplished upon the mating of the faying surfaces and is not dependent upon the torque required to produce the joint load.

6.5 Due to the comprehensive nature of this revision the margins of this specification have not been marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue have been made. Bidders and contractors are advised to evaluate the requirements of this document based on the entire content irrespective of the relationship to the last previous issue.

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OMB Approval
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DOCUMENT IDENTIFIER AND TITLE

MIL-S-82496A "Screws, Machine, Self-Sealing, Integral O-Ring"

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

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MIL-S-82496A
NOTICE 1
24 JUNE 1994

NOTICE
OF VALIDATION

MILITARY SPECIFICATION

SCREWS MACHINE SELF SEALING, INTEGRAL O-RING

MIL-S-82496A dated 30-APR-77 has been reviewed and determined to be valid for use in acquisition

Custodians

Navy - OS

Preparing activity
DLA- IS

AMSC N/A

FSC 5305

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