

MIL-N-85353
15 July 1981

MILITARY SPECIFICATION

NUTS (FASTENERS), INTERNALLY THREADED, PRELOAD LOCKING, 450°F, 800°F and 1200°F, GENERAL SPECIFICATION FOR

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 preload locking nuts (hereinafter referred to as internally threaded fasteners) to be used in applications where temperatures will not exceed 450°F, 800°F and 1200°F.

1.2 Classification. Fastener threads shall be classified as follows:

Type I - 450°F
Type II - 1200°F
Type III - 800°F

2. APPLICABLE DOCUMENTS

2.1 Specifications, Standards and Handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in the current Department of Defense Index of Specifications and Standards (DODISS) and the supplement thereto (if applicable) form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-P-416 Plating, Cadmium (Electrodeposited)

PPP-H-1581 Hardware (Fasteners and Related Items) Packaging
and Packing for Shipment and Storage

MILITARY

MIL-S-8879 Screw Threads, Controlled Radius Root with
Increased Minor Diameter, General Specification for

MIL-N-25027 Nut, Self-Locking, 250°F, 450°F, and 800°F, 125
KSI Ftu, 60 KSI Ftu, and 30 KSI Ftu.

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 Air Engineering Center, ESSD, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 5310

MIL-N-85353

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-794	Parts and Equipment, Procedures for Packaging and Packing of
MIL-STD-1312	Fasteners, Test Methods
MS14194	Nuts (Fasteners), Internally Threaded, Preload Locking, 450°F, 800°F, 1200°F, Reliability and Maintainability Design Requirements for
MS21045	Nut, Self-Locking, Hexagon-Regular Height, 450°F, 125 KSI Ftu
MS21084	Nut, Self-Locking, Steel, 200 KSI Ftu, 450°F, Flanged
MS21296	Bolt, Tension, Steel, 260 KSI Ftu, External Wrenching, Spline Drive, Flanged Head

(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.

American National Standards Institute

ANSI B46.1 Surface Texture (Surface roughness, Waviness and Lay)

(Application for copies should be addressed to American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.)

National Aerospace Standards

NAS5002	Bolt, Pan Head, Close Tolerance Short Thread, Tri-Wing ^R Recess, Alloy Steel, Self-Locking and Non-Locking
NAS5102	Bolt, Pan Head, Close Tolerance Short Thread, Tri-Wing ^R Recess, A286 Cres., Self-Locking and Non-Locking
NAS6603-6612	Bolt, Hex Head, Close Tolerance, Alloy Steel, Long Thread, Self-Locking and Non-Locking

MIL-N-85353

NAS6703-6712

Bolt, Hex Head, Close Tolerance, A286 Cres.,
Long Thread, Self-Locking and Non-Locking

(Application for copies of the above publications should be addressed to National Standards Association, Inc., 5161 River Road, Washington, D.C. 20016)

3 REQUIREMENTS

3.1 Specification Sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The preload locking fastener furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.3).

3.2.1 Retention of Qualification. To maintain status on a Qualified Products List, certification shall be submitted to indicate continued compliance with the requirements of this specification (see 4.5).

3.3 Materials Fastener material shall be as specified on the applicable specification sheet.

3.4 Design and Construction. The design and construction of the fastener shall be as specified herein and in accordance with the applicable specification sheets

3.5 Lubrication. The fastener may have a coating of dry film lubrication, which meets the lubrication requirements specified in MIL-N-25027. The lubrication shall be applied as shown on the specification sheet, military standard or drawing.

3.6 Dimensions. Dimensions shall be as specified on the applicable specification sheet and are to be met after plating but before lubrication. Plated dimensions and unplated dimensions are prior to any lubrication. Thread form, dimensions, and gaging shall be as specified in MIL-N-85353/1

3.7 Plating or Surface Treatment. Type I fasteners fabricated from alloy steel shall be cadmium plated in accordance with QQ-P-416, Class 2, Type II, or as shown on the applicable specification sheet. Within one hour after plating, all parts 180 KSI and above shall be baked for not less than 23 hours at 375°F ± 25°F.

3.7.1 1200°F and 800°F Corrosion-Resistant Steel. The Type II fastener threads fabricated for 1200°F and Type III fastener threads fabricated for 800°F may be silver plated in accordance with AMS2410 or provided with a coating or finish in accordance with the applicable specification sheet.

3.8 Torque. Except for the torque required to preload lock the fastener, the torque required to assemble the fastener shall be not greater than finger torque (see 4.8)

MIL-N-85353

3.9 Identification of Product. The preload locking fastener shall be identified as indicated on the applicable specification sheet.

3.10 Mechanical Properties

3.10.1 Stress Corrosion. There shall be no fracture, permanent set or deformation of fastener when subjected to a stress corrosion test (see 4.3.5).

3.10.2 Tensile Strength Tensile strength of preload locking fastener shall meet the values shown on the applicable specification sheet. Qualification test samples shall meet the tensile strength values specified in Table IV (see 4.3.6).

3.10.3 Locking Torque. Locking torque shall not be less than 80% of the seating torque listed in Table V for 50 cycles (see 4.3.7).

3.10.4 Reusability. The threads shall show no distortion or scratches when tested in accordance with 4.3.8.

3.10.5 Vibration. There shall be no malfunction or deterioration of the fastener when subjected to the vibration test (see 4.3.9). The vibration test is not required for size .1640-32 and sizes larger than 5000-20

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. Qualification inspection (see 4.3)
- b. Quality conformance inspection (see 4.6)

4.3 Qualification Inspection. Qualification inspection shall consist of all the examinations and tests listed in Table I.

TABLE I. Qualification Inspections.

Inspection	Requirement Paragraph	Test Method Paragraph
Visual Examination	-	4.7
Stress Corrosion (3 samples)	3.10.1	4.3.5
Tensile Strength (5 samples)	3.10.2	4.3.6
Locking Torque (10 samples)	3.10.3	4.3.7, 4.6.3
Reusability (10 samples)	3.10.4	4.3.8, 4.6.3
Vibration (10 samples)	3.10.5	4.3.9

MIL-N-85353

4.3.1 Sample Size Unless otherwise specified, the qualification samples shall consist of 45 fastener specimens and 45 bolts for each diameter and type for which qualification is desired. The fastener specimens shall contain the thread form specified in MIL-N-85353/1. Bolts shall conform to Table II of this specification

4.3.1.1 Similarity (fine and coarse threads). Qualification approval of the fine thread series shall constitute qualification approval of the coarse thread series for the same diameter.

TABLE II. Bolt Requirements for Qualification Tests.

UNJF3A Thread Diameter and Pitch	Bolt Standard 1/		
	Type I	Type II	Type III
1640-32	NAS5002	NAS5102	-
.1900-32	NAS6603	NAS6703	MS21296-03
.2500-28	NAS6604	NAS6704	MS21296-04
.3125-24	NAS6605	NAS6705	MS21296-05
.3750-24	NAS6606	NAS6706	MS21296-06
.4375-20	NAS6607	NAS6707	MS21296-07
.5000-20	NAS6608	NAS6708	MS21296-08
.5625-18	NAS6609	NAS6709	MS21296-09
.6550-18	NAS6610	NAS6710	MS21296-10
7500-16	NAS6612	NAS6712	MS21296-12

NOTE 1/: Bolts of the same strength level and thread dimensions may be used in lieu of specified bolts.

4.3.2 Inspection Routine For qualification testing, the internally threaded fastener shall conform to the dimensional limits of MS21045 for Type I and II fastener threads; and MS21084 for Type III fastener threads except that there shall be no prevailing locking element. The nut height shall be the maximum height specified on the above standards + .000 and -.010.

4.3.3 Certified Test Report. The qualification inspection will be authorized only upon presentation of certified test reports to the activity responsible for qualification (see 6.3) indicating that the fasteners of the sizes to be tested have met or will meet the requirements of this specification. These test reports shall include the actual results of all tests specified by this specification. When the test reports are submitted, a drawing in specification sheet format shall be submitted indicating the locking feature of the thread.

4.3.4 Limitations. Qualification inspection shall be limited to the thread sizes listed in Table III.

MIL-N-85353

TABLE III Thread Sizes for Qualification

Diameter and Thread Pitch
.1640-32
.1900-32
.2500-28
.3125-24
.3750-24
.4375-20
.5000-20
.5625-18
.6250-18
.7500-16

4 3 5 Stress Corrosion Test. Three type III samples shall be tested simultaneously in accordance with the stress corrosion test specified in MIL-STD-1312, Test 9. The test shall be conducted for 1000 hours at which time the test will be terminated. The test shall be conducted at 45% of the ultimate tensile specified in Table IV.

TABLE IV Qualification Test Nut Strength Requirement.

Thread Pitch and Diameter	Minimum Axial Tensile Strength (lbs.) 1/	
	Type I & II	Type III
.1640-32	2,490	3,420
.1900-32	3,470	4,780
.2500-28	6,200	8,530
.3124-24	9,820	13,500
.3750-24	15,200	20,900
.4375-20	20,600	28,300
.5000-20	27,500	37,700
.5625-18	34,800	47,900
.6250-18	43,600	59,900
.7500-16	63,200	86,900
.8750-14	86,300	118,600
1.0000-12	112,400	154,600
1.1250-12	114,100	198,200
1.2500-12	179,700	247,100

1/ Ultimate tensile strength = F_{tu} 160,000 psi for Type I and Type II and 220,000 psi for Type III. Based on basic thread pitch diameters for bolt thread diameters greater than .3124 and 98% basic pitch diameter for smaller sizes.

MIL-N-85353

4.3.6 Tensile Strength Sample units shall be subjected to the tensile test specified in MIL-STD-1312, Test 8. Three samples shall be assembled and baked for six hours at the temperature applicable to the type. The samples shall then be cooled to room temperature for not less than one hour. The baked assemblies and three additional samples in the "as received" condition shall be subjected to the tensile test using the loads specified in Table IV.

4.3.7 Locking Torque The fasteners shall be seated against a hardened steel bushing (Rc 40 and surface roughness 63) to the seating torque specified in Table V. Locking (unseating) torque shall be recorded. The fastener samples and test bolts shall be tested for 50 cycles.

4.3.8 Reusability The preload locking fastener shall be seated to the torque values shown in Table V for not less than 50 cycles. The threads of the bolts and internally threaded fastener used in the torque tests shall be examined for distortion or scratches. The threads of the test bolts shall remain in serviceable condition and shall permit installation of a new preload locking internally threaded fastener. For quality conformance inspection, the fastener shall be seated to the torque values shown in Table V for not less than 10 cycles.

4.3.9 Vibration. The fastener samples and test bolts shall be torqued to the seating torque values specified in Table V. Testing shall be conducted in accordance with MIL-STD-1312, Test 7. Seat fastener 5 times before vibration test. The test shall be concluded at the end of 30,000 cycles.

TABLE V Seating Torque.

Diameter and Thread Pitch	Torque (in-lbs)
1640-32	30
1900-32	40
2500-28	80
3125-24	175
3750-24	325
4375-20	575
5000-20	750
5625-18	1100
6250-18	1500
7500-16	2100

4.4 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.5 Retention of Qualification Certification shall be requested by NADC (Naval Air Development Center) from each manufacturer and forwarded to the preparing activity for those specifications which do not contain a requirement for retention of qualification by testing. Certification shall be at the time of the two year review and shall be signed by a responsible official of management, attesting that the listed product(s) is still available from the listed plant, can be produced under the same conditions as originally qualified (i.e., same process, materials, construction, design, manufacturer's part number, or designation); and meets the requirements of the current issue of the speci-

MIL-N-85353

cation Failure to provide the certification will be cause for removal from the QPL After completion of the certification review, the QPL shall be reprinted to show the date of validation (DD Form 1718, Certification of Qualified Products, shall be used for obtaining certification.)

4 6 Quality Conformance Inspection Quality conformance inspection shall consist of all the examinations and tests listed in Table VI

Table VI. Quality Conformance Inspections

Inspection	Requirement Paragraph	Test Method Paragraph
Visual Examination	-	4.6.2, 4 7
Dimensions	3.6	
Torque	3.8, 3.10.3	4.8
Reusability	3 10.4	4.3 8

4 6.1 Sampling The samples shall be selected at random from each lot as specified in Table VII.

TABLE VII. Attribute Plan.

Lot Size	Sample Size	Acceptance Number
Under 10,000	5	0
10,000 through 50,000	10	0
50,000 through 100,000	15	0
Over 100,000	27	1

4 6 1 1 Inspection Lot. An inspection lot shall consist of finished fasteners which are identical in size and produced under the same conditions, and presented for inspection at the same time.

4.6 2 Classification of Defects All dimensional characteristics are defective when out of tolerance. The classification of defects for preload locking fasteners shall be as follows:

Major: Locking feature out of tolerance.

Minor A. Rough threads (thread finish out of tolerance).

Minor B. Burrs and slivers in thread form.

Acceptable Quality Levels:

Major	1 0 percent
Minor A	2 5 percent
Minor B	4 0 percent

MIL-N-85353

4.6.3 Sampling For Minimum Locking Torque or Reusability. Sampling for locking torque and reusability tests shall be in accordance with Table VII. The same sample shall be used throughout for these tests. The acceptance and rejection numbers shall apply to these tests taken separately, i.e., a thread may be classified as defective for locking (unseating) torque or reusability.

4.7 Visual Examination. Each fastener shall be examined visually for defects to determine conformance to this specification. Each fastener selected as a sample unit from the lot shall be examined for major and minor defects. The classification of defects shall be used to classify and enumerate the defects. The fasteners shall be examined for conformance to the applicable specification sheet, relative to:

- a. Gaging of locking feature
- b. Thread finish
- c. Presence of burrs and slivers
- d. Identification or product
- e. Dimensions

4.8 Torque. The fastener samples shall be seated on a bolt using no more than finger torque. The bolt shall conform to Table II except that the thread length shall not be less than six inches.

4.9 Packaging, Packing and Marking. Preparation for delivery shall be examined for conformance to Section 5.

5. PACKAGING

5.1 Preservation (Level A or Commercial Packaging). The requirements for packaging shall be in accordance with MIL-STD-794 for Level A or commercial Packaging.

5.2 Packing (Level A or Commercial Packing). The requirements for packing shall be in accordance with PPP-H-1581 for Level A or commercial packing.

5.3 Marking. In addition to any special marking required by the contract unit and intermediate packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The preload locking fastener is intended for use as a locking device for both permanent reusable installations on such applications as rod end bearings, compressor wheel hold down nuts, preload locking clamp nuts, hydraulic actuator lock nuts, stud lock nuts and as a secondary locking device where dual locking is required. Fasteners are subjected to the design and usage limitations of MS14194.

6.2 Ordering Data. Procurement documents should specify the following.

- a. Title, number and date of this specification
- b. Type required (see 1.2)
- c. Quantity
- d. Level of Packing (see 5.1)

MIL-N-85353

6.3 Qualification. With respect to products incorporating locking designs requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the contractors is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Navy Department, Washington, DC 20360 and information pertaining to qualification may be obtained from the Naval Air Development Center (NADC), Code 6013, Warminster, PA 18974.

6.3.1 Qualification tests will be authorized only upon presentation of certified test reports indicating that the fasteners have met or will meet the requirements of this specification.

6.4 Definitions

6.4.1 Installed. A preload locking nut is considered installed when the proper torque is applied even though no external threads extend beyond the top of the nut.

6.4.2 Unseating Torque The unseating torque is that torque required to start nut rotation from a seated position during removal.

6.4.3 Product Design Change A product design change is any change in product design or description

6.4.4 Preload Locking Torque. Torque applied that provides clamp-up and locks the bolt thread crest to the nut thread ramp after the free running nut is seated.

6.4.5 Free Running. A nut that can be installed on a bolt thread with no more than finger tight prevailing torque. Self-locking action is obtained upon clamp-up of the material.

6.4.6 Clamp-up Torque The torque applied that preloads for uniform loading of the standard assembly.

Custodians:

Navy - AS
Army - MI
Air Force - 11

Preparing activity:

Navy - AS
(Project No. 5310-1145)

Review activities.

Air Force - 99
Army - AV
DIA - IS

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DOCUMENT IDENTIFIER (Number) AND TITLE

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 PRELOAD LOCKING 4500F, 8000F and 12000F, GENERAL SPECIFICATION FOR

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

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DATE

DD FORM 1426
 1 OCT 76

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