

INCH-POUND

MIL-DTL-18240F

2 JUNE 1997

SUPERSEDING

MIL-F-18240E

1 DECEMBER 1989

DETAIL SPECIFICATION

FASTENER ELEMENT, SELF-LOCKING, THREADED FASTENER, 250°F MAXIMUM

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

1. SCOPE

1.1 Scope. This specification defines the requirements for self-locking elements for use in externally threaded fasteners such as bolts and screws to be used in fasteners with either UNC, UNJC, UNF, UNJF, UNRC or UNRF threads and where the temperatures will not exceed 250°F.

1.2 Classification. This specification includes three types of self-locking elements as follows:

Type N Plug/Pellet

Type L Strip

Type P Patch

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 53GP.

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-DTL-18240F

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government document.

2.2.1 Specifications Standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specification and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

- QQ-P-416 - Plating, Cadmium (Electrodeposited).
- GGG-W-686 - Wrench, Torque, Unidirectional.

DEPARTMENT OF DEFENSE

- MIL-S-7742 - Screw Threads, Standard, Optimum Selected Series: General Specification for
- MIL-S-8879 - Screw Threads, Controlled Radius Root with Increased Minor Diameter, General Specification for.

STANDARDS

FEDERAL

- FED-STD-H28/2 - Screw Threads Standards for Federal Services Section 2 Unified inch Screw Threads UN and UNR Thread Forms

DEPARTMENT OF DEFENSE

- MIL-STD-1312-7 - Fastener, Test Methods, Method 7, Vibration
- MS15981 - Fasteners, Externally Threaded, Self-locking, Design and Usage Limitations For

MIL-DTL-18240F

AIR FORCE - NAVY AERONAUTICAL

AN 3 THRU AN 20 - Bolt, Machine, Aircraft.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issue of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC Z1.4- Sampling Procedures and Tables for Inspection by Attributes

(Application for copies should be addressed to AMERICAN SOCIETY FOR QUALITY CONTROL, P.O. Box 3005, 611 E Wisconsin Ave, Milwaukee, WI 53201-4606)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME B1.1- Unified Inch Screw Threads (UN and UNR Thread Form) (DoD adopted)

(Application for copies should be addressed to American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield NJ 07007-2900)

NATIONAL AEROSPACE STANDARDS (NAS)

NAS 600 THRU NAS 606- Screw, Machine, Aircraft, Pan Head, Cruciform Recess, Full Threaded, Alloy Steel. (DoD adopted)

(Application for copies should be addressed to the Aerospace Industries Association of America, Inc., 1250 Eye Street, N.W., Washington, DC 20005.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM D1535 - Standard Practice for Specifying Color By The Munsell System

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, W. Conshohocken, PA (19428-2959).

MIL-DTL-18240F

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications or specification sheets), the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The self-locking elements furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.2 and 6.3).

3.1.1 Extent of qualification. Qualification approval of external self-locking element in UNF or UNJC external thread constitutes approval of external self-locking element in UNC, UNJC, UNF, UNJF, UNRC, or UNRF external thread of the same diameter.

3.2 Design. The self-locking element design shall conform to the types illustrated on figure 1 and MS15981.

3.2.1 Dimensions. The self-locking element dimensions shall be as specified in table I, table IA, and figure 1. In cases of dimensional conflict, the dimensions of table I, table IA and figure 1 shall take precedence over those identified in MS15981.

3.3 Performance characteristics.

3.3.1 Torque. The self-locking fastener shall conform to the torque test as specified in 4.4.2.

3.3.2 High temperature torque. The self-locking fastener shall conform to the high temperature torque test in 4.4.3.

3.3.3 Off prevailing torque at maximum temperature. The self-locking fastener shall meet the off minimum prevailing torque values specified in table II at maximum temperature when tested in accordance with 4.4.4.

3.3.4 Vibration. The self-locking fastener shall be subjected to and pass the vibration test for 30,000 cycles as specified in 4.4.5. For qualification purposes, the activity responsible for qualification may waive the vibration requirement for thread sizes greater than .500 inch provided the .500 inch thread size having the same type locking element has passed the vibration test. The vibration test is not required for thread sizes below .190.

3.4 Reusability. The self-locking fastener shall be capable of 5 seated cycles without damage to either the nut or bolt threads (see 4.4.2d through f and 4.4.6).

3.5 Identification.

MIL-DTL-18240F

3.5.1 Self-locking element. The self-locking element shall be identified by color code as identified in ASTM D1535 and in table VIII.

3.5.2 Color. Each manufacturer of the products specified herein shall color code their self-locking elements produced per this specification in accordance with their designated colors identified per QPL-18240.

3.6 Workmanship. Workmanship shall be consistent with high-grade commercial practice. Parts are required to be free of burrs and slivers except slight burrs are permissible in the area of the self-locking element provided maximum locking torque values specified in table II are not exceeded.

4. VERIFICATION

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

- a. Qualification inspection (see 4.2).
- b. Quality conformance inspection (see 4.3).

4.1.1 Responsibility of the self-locking element supplier. The self-locking element supplier shall be responsible for compliance with all the requirements of sections 3 and 4. The seller of the completed fastener shall be responsible for proving that the fastener product has met all the quality conformance inspections of the completed fastener.

4.2 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government on sample units produced with equipment and procedures normally used in production. Qualification inspections shall be as specified in table VII. Qualification inspection shall be limited to the fasteners shown in tables IV and shall be authorized only upon presentation of certified test reports to the activity responsible for qualification. The test reports shall include actual results of all the tests and a drawing which shows the location, size, material, method of attachment and protrusion of the self-locking element for each diameter upon which qualification is desired. A manufacturer's designation shall be submitted for the locking element to be used in each diameter of fastener. For qualification of sizes up to and including .500" (government designation 80), the manufacturer must submit samples for full testing to be conducted by the qualifying test facility for each individual desired size. For qualification of sizes above .500" nominal diameter size, the manufacturer must submit actual torque test data and samples of the specific size to the qualifying testing facility and must be qualified to the .500" nominal diameter size.

4.2.1 Retention of qualification. Certification shall be requested by Naval Air Warfare 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 or management,

MIL-DTL-18240F

attesting that the listed product(s) is still available from the listed plant, and is 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 specification. Failure to provide the certification will be cause for removal from the QPL.

4.2.2 Sampling instructions. The qualification inspection samples shall consist of 60 fasteners with the self-locking elements conforming to table IV for each diameter for which qualification is desired. All test nuts necessary for the inspections shall conform to tables VA and VB and shall be furnished by the manufacturer. Samples shall be identified as required and forwarded to the activity designated in the letter of authorization from the activity responsible for qualification (see 6.3).

4.3 Quality conformance inspection. Prior to installation of the self-locking element, the quality conformance inspections of the applicable fastener specification shall be met. In addition, after installation of the self-locking element on to the applicable fastener, the quality conformance inspections specified in table VI shall be met. Also, the self-locking fastener shall meet any other tests which are considered necessary by the procuring activity to determine conformance with the requirements of this specification. Any rework of the fastener as defined by the Fastener Quality Act shall require retesting.

4.3.1 Sampling. For the quality conformance inspections specified herein, the sample self-locking fasteners shall be selected at random from each finished lot as specified in 4.3.1.1. Group A quality conformance inspection sampling shall be in accordance with ANSI/ASQZ 1.4-1993, single sampling inspection, Level II, of zero acceptance level. Group B torque inspection sampling shall be in accordance with the sampling plan in table IX or X at the supplier's option.

4.3.1.1 Lot. A lot shall consist of finished fasteners with the self-locking element incorporated which are of the same diameter and length, fabricated by the same process, heat treated in the same manner, and produced as one continuous run or order or part thereof, whichever is of the smaller quantity.

4.4 Methods of inspection.

4.4.1 Examination of product. The self-locking fastener shall be examined for the following items before any other tests are conducted..

- a. Presence of self-locking element.
- b. Location of self-locking element.
- c. Dimensions of self-locking element.
- d. Presence of burrs and slivers (see 3.6).

MIL-DTL-18240F

e. Identification of product.

4.4.2 Torque test. For qualification testing 10 sample fasteners with self-locking elements installed as specified in table IV shall be tested with the test nuts specified in tables VA and VB. For quality conformance purposes, the bolts shall be as specified in the applicable document which requires a self-locking element per MIL-DTL-18240 and the test nut shall be as specified in table VA and VB for the correct thread type. The following test shall be performed:

NOTE: Parts that can not be seated shall be tested unseated.

- a. Prior to the actual testing of self-locking screws and bolts, a test nut as specified in table VA and table VB with the same thread form, class and pitch, shall be gauged with a go and no go threaded plug gage. The test nut shall not accept the no go gage for more than 1.5 turns and shall freely accept the go gage for the entire length of the nut. The minor thread diameter shall also be checked for conformance with table VA and VB.
- b. A light lubricating oil shall be applied directly to the locking element prior to torque testing, unless otherwise specified. (see 6.4.1)
- c. The torque shall be measured using a calibrated torque wrench in accordance with GGG-W-686 or a digital torque sensor capable of measuring the torque values encountered during the test. (see 6.4.2)
- d. A self-locking fastener shall be assembled with hardened spacers, or washers as necessary, and a test nut. The total thickness of the spacers and washers for the test assembly shall be selected so that the locking element of the self-locking fastener is fully engaged in the test nut. Set screws shall be tested in a blindhole. If the self-locking fastener is turned, the restraining mechanism shall be such that it imparts no radial load to the nut. For testing of self-locking fastener without sufficient thread length for a locking element in accordance with table I or for thread sizes not covered in table II only a positive indication of off prevailing torque is required for five cycles. Sufficient thread length is eight threads (one complete thread pitch, plus five complete thread pitches for the locking element, plus two run-out pitches for ease of starting, for a total of eight threads minimum.) Sufficient thread length may be calculated as follows:

MIL-DTL-18240F

$$\text{Sufficient Thread Length} = \frac{1}{P} \times 8$$

Where P = Thread Pitch

EXAMPLE: .250-28 Thread

$$\text{Sufficient Thread Length} = \frac{1}{28} \times 8 = .286in$$

- e. First cycle test: During the first tightening of the assembly, the 1st cycle ON PREVAILING TORQUE (see 6.5) shall be measured and recorded.. Tightening shall be continued until the required SEATING TORQUE (see 6.5) as specified in table II for the applicable thread size and pitch is developed. The axial clamp load shall be reduced to zero by backing the self-locking fastener or test nut off, until the spacers are free to rotate. Following the removal of the axial clamp load, the 1st cycle OFF PREVAILING TORQUE (see 6.5) shall be measured during the next 360 degrees of rotation and recorded. The self-locking fastener and test nut shall be disassembled until the locking element is disengaged. The driving speed shall not exceed 30 RPM.
- f. Second through fifth cycle tests: The self-locking fastener and test nut shall be reassembled, seated, and disassembled four more times following the same procedure as the 1st cycle test. The ON and OFF PREVAILING TORQUE shall be measured and recorded for each cycle. Sufficient time shall elapse between torquing cycles to prevent overheating of the test assembly. During the torque test the temperature shall not be greater than 75°F above the starting temperature.
- g. For qualification testing any torque value determined to be in excess of the limitations of table II constitutes failure of this test. For quality conformance testing determine whether the lot passes or fails in accordance with table IX or table X.

4.4.3 High temperature torque.

- a. Assemble ten new fasteners as tested in 4.4.2, steps a through d and the on cycle of step e.
- b. Bake the assemblies to 250°F ±10° for 3 hours.
- c. Air cool the assemblies to room temperature for a minimum of 1 hour.

MIL-DTL-18240F

- d. Test the torque values as indicated in 4.4.2, steps e through f, starting with the first OFF PREVAILING TORQUE. Any torque determined in this test to be in excess of 150 percent of the maximum prevailing torque values in table II or not meeting the minimum prevailing torque in table II constitutes failure of this test.

4.4.4 OFF PREVAILING TORQUE at maximum temperature.

- a. Assemble the same ten fasteners used in paragraph 4.4.3.
- b. Bake the assemblies for one hour to 250°F ±10°.
- c. While the fastener is still at 250°F, determine that the OFF PREVAILING TORQUE value shall not be less than the minimum prevailing torque value listed in table II.

4.4.5 Vibration. Sample nuts and bolts of the size and quantities specified in table III shall be subjected to the vibration test specified in MIL-STD-1312-7, Vibration. The sample nuts and bolts shall be assembled to the specified torque in table III and disassembled 4 times, then reassembled and tested. The fastener assembly shall traverse the entire length of the slots in the test fixture during the test.

4.4.5.1 Vibration failure conditions. The self-locking element shall have failed the vibration test for any of the following conditions:

- a. When any structural failure occurs in the fastener in the region of the self-locking element during the vibration test such as a crack intersecting the region of the threads containing the self-locking element.
- b. When any nut rotates greater than 360° during 30,000 cycles.
- c. When any nut can be turned completely on or off the bolt or screw, with the fingers, during or after completion of 30,000 cycles.

4.4.6 Reusability. At the conclusion of the tests specified in 4.4.2 (and 4.4.3 and 4.4.4 for qualification testing), the test nuts and self-locking fasteners used in this test shall be examined for damage to the threads. Noticeable distortion or scratches deep enough to reduce the efficiency of the threads shall be considered a failure of the self-locking element. The threads shall remain in serviceable condition and permit the installation of a new self-locking fastener or test nut (as applicable) freely with the fingers up to the self-locking element.

4.4.7 Noncompliance. If a sample fails to pass Group B inspection of table VI, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of products which can be corrected and which are manufactured under essentially the same

MIL-DTL-18240F

materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the inspection activity has been taken. After corrective action has been taken, Group B inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstated; however, final acceptance and shipment shall be withheld until the Group B inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products or by contacting the responsible packaging activity.

6. NOTES.

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory).

6.1 Intended use. The self-locking elements covered by this specification are intended to be incorporated in external screw threads to be used in applications where maximum temperature does not exceed 250°F. When these self-locking elements are incorporated in external threads and are used in compliance with MS15981, all the configurations of figure 1 are interchangeable. Type N element, plug/pellet configuration is intended to be installed via a hole drilled into the fastener. Type L element, strip configuration is intended to be installed via a strip cut through the threads parallel to the length of the fastener. Type P element, patch configuration is intended to be installed without removal of any material of the fastener. A specific type should be specified only when required by design or application requirements. The prevailing-torque values given in this specification are conformance requirements for self-locking elements and apply only to the combination of test conditions described in the locking torque test procedure. If the conditions of the actual service application differs from those of 4.4.2 (e.g. internally threaded hole in a different material, length of thread engagement, class of internal thread tolerance, speed of driving, different plating or coating on screw or mating part) the prevailing-torque values may vary. Such values can only be determined through testing the locking element in its application. The plug/pellet is not recommended for sizes below .190.

MIL-DTL-18240F

6.1.1 Cross reference.

From Configurations listed in Revision D dated 25 February 1972

Configuration A plug /pellet type	superceded by Type N
Configuration B strip type	superceded by Type L
Configuration B patch type	superceded by Type P

6.2. Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation.
- c. Type (see 1.2, table I and figure 1).
- d. Part number in accordance with the applicable standard.
- e. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in qualified products list QPL-18240, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Naval Air Warfare Center Air Craft Division, Code 435200A, Bldg 2187, 48110 Shaw Rd., Unit 5, Patuxent River MD, 20670-1906.

6.3.1 Qualification evaluation. Qualification inspection and evaluation of type N (see figure 1) locking element designs were based on the protrusion of the element being in accordance with figure 1, dimension "B". Type N designs with protrusion of "B + 0.007 inch and design that are otherwise the same as listed, also have qualification approval. To identify the element design with greater protrusion of the dimension "B + 0.007 inch, figure 1 of this specification, the additional +0.007 inch protrusion must be specified on the standard or drawing for the part, for nonstandard parts that require a specific configuration, add a "P" to the government designation.

6.4 Torque test notes

6.4.1 A light oil such as Rainkote 400 or equivalent is used in the test (4.4.2) of fasteners to reduce wear, prevent galling or seizure, prevent fretting, and aid in the installation and removal of fasteners. A minimum amount may be used. This will give more consistent torque test results.

6.4.2 Some torque measuring devices, such as beam wrenches, could be 20-40% off on the lower 20 percent of the scale and should not be used.

MIL-DTL-18240F

6.5 Definitions.

6.5.1 Self-locking externally or internally threaded fastener(s). In this specification a "self-locking externally threaded fastener" refers to bolts, or screws, that incorporate self-locking elements conforming to this specification.

6.5.2 ON PREVAILING TORQUE. The maximum torque occurring while the fastener is being installed and prior to development of any axial clamp load.

6.5.3 SEATING TORQUE. The torque required to overcome the self-locking feature and produce an axial clamp load to the test assembly.

6.5.4 OFF PREVAILING TORQUE. The maximum torque occurring while the fastener is in motion during the first 360 degrees of rotation in the untightening direction after the test assembly has been unseated.

6.6 Subject term (keyword) listing.

Plug/Pellet
Strip
Patch

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

6.8 Previously manufactured product. Product manufactured prior to the date of this specification may be used until the supply is exhausted.

MIL-DTL-18240F

TABLE I Self-locking element dimensions. (see figure 1)

Gov't Des.	Nom dia	Type	A		B		C		D
			Max	Min	Max	Min	Max	Min	Min
04	.112	L,P	.250	.125	.115	.105	.312	.180	.025
		N <u>1/</u>	.106	.053			.161	.121	.053
06	.138	L,P	.312	.156	.141	.131	.390	.234	.030
		N <u>1/</u>	.106	.066			.184	.144	.066
08	.164	L,P	.312	.156	.167	.157	.390	.234	.030
		N <u>1/</u>	.124	.084			.192	.152	.084
10	.190	L,P	.312	.156	.193	.183	.390	.234	.030
		N	.124	.084			.208	.150	.084
40	.250	L,P	.326	.178	.253	.243	.415	.267	.025
		N	.144	.089			.231	.191	.089
50	.312	L,P	.364	.208	.315	.305	.468	.312	.025
		N	.188	.130			.278	.222	.130
60	.375	L,P	.474	.208	.378	.368	.578	.312	.035
		N	.166	.146			.284	.230	.146
70	.437	L,P	.456	.250	.440	.430	.581	.375	.035
		N	.166	.146			.301	.261	.146
80	.500 <u>2/</u>	L,P	.581	.250	.503	.493	.706	.375	.035
		N	.166	.146			.301	.261	.146
90	.562 <u>2/</u>	L,P	.827	.278	.566	.552	.954	.417	.055
		N	.199	.175			.363	.323	.175
100	.625 <u>2/</u>	L,P	.850	.278	.628	.616	.986	.417	.055
		N	.197	.175			.363	.323	.175
120	.750 <u>2/</u>	L,P	.999	.312	.753	.741	1.150	.469	.055
		N	.235	.209			.411	.321	.209
140	.875 <u>2/</u>	L,P	1.143	.357	.878	.864	1.311	.536	.055
		N	.235	.209			.427	.387	.209
160	1.000 <u>2/</u>	L,P	1.250	.471	1.003	.987	1.437	.625	.055
		N	.235	.209			.427	.387	.209
180	1.125 <u>2/</u>	L,P	1.417	.417	1.128	1.112	1.632	.625	.055
		N	.266	.240			.516	.387	.240
200	1.250 <u>2/</u>	L,P	1.604	.417	1.253	1.237	1.819	.625	.055
		N	.266	.240			.516	.452	.240

1/ Plug/Pellet is not recommended for sizes below .190.

2/ Screws .500 inch and larger may have two self-locking elements. They shall not be more than 120 degrees of thread diameter apart.

MIL-DTL-18240F

Table IA Screw and bolt slot and hole depths for self-locking strips and pellets.

NOM DIA	SLOT DEPTH MAX	PELLET DEPTH MAX
.112	.048	.065
.138	.052	.080
.164	.060	.090
.190	.062	.100
.250	.070	.125
.312	.075	.125
.375	.100	.125
.437	.100	.150
.500	.100	.175
.562	.100	.175
.625	.100	.225
.750	.100	.225
.875	.100	.225
1.000	.100	.250
1.125	.125	.250
1.250	.125	.250

MIL-DTL-18240F

TABLE II Torque. 1/ 3/

Bolt, or screw thread size	SEATING TORQUE inch-pound $\pm 10\%$ <u>2/</u>	PREVAILING TORQUE MAX. ON OR OFF inch-pound	PREVAILING TORQUE MIN. ON OR OFF inch-pound
.112	8.0	5.0	.5
.138	15.0	8.0	1.0
.164	28.0	12.0	1.5
.190	45.0	18.0	2.0
.250	110.0	40.0	3.0
.312	190.0	85.0	5.0
.375	345.0	110.0	9.0
.437	545.0	150.0	12.0
.500	850.0	220.0	16.0
.562	1,050.0	270.0	22.0
.625	1,450.0	350.0	30.0
.750	2,560.0	460.0	45.0
.875	4,180.0	700.0	65.0
1.000	6,230.0	900.0	85.0
1.125	7,800.0	1050.0	110.0
1.250	11,200.0	1150.0	140.0

1/ These values apply to MIL-S-8879, MIL-S-7742, ASME B1.1, and FED-STD-H28/2 threads. They do not apply to Class 1A threads.

2/ These values are for testing only, and are NOT recommended installation torque values.

3/ Values for coarse and fine threads are the same.

MIL-DTL-18240F

TABLE III. Vibration requirements.

Nut size	Bolt size	MIL-STD-1312/7 Vibration	
		Bolts and nuts required (min. of each)	Seating Torque (in.-lb)
.190-32	AN3-15A	5	36
.250-28	AN4-16A	5	60
.312-24	AN5-16A	5	120
.375-24	AN6-17A	5	160
.437-20	AN7-17A	5	200
.500-20	AN8-20A	5	300

TABLE IV. Length and diameter of self-locking fasteners required
for qualification inspection.

Basic part no.	Length dash no.	Basic part no.	Length dash no.
NAS600	12P	AN8	20
NAS601	12P	AN9	21
NAS602	12P	AN10	21
AN3	15	AN12	21
AN4	16	AN14	23
AN5	16	AN17	24
AN6	17	AN18	25
AN7	17	AN20	27

MIL-DTL-18240F

TABLE VA. Dimensions of nuts required for qualification and conformance tests (inches) 1/ 2/ 3/ 4/ 5/
UNF, UNJF, UNC, UNJC THREAD FORMS

Thread size	Minimum width across flats	Nut thickness +/- .010	90-degree csink dia +/- .010	Minor Dia.	
				Min	Max
.112-48	.240	.165	.132	.0929	.0957
.112-40	.240	.200	.132	.0894	.0922
.138-40	.302	.200	.168	.1148	.1176
.138-32	.302	.250	.168	.1094	.1122
.164-36	.334	.250	.194	.1379	.1407
.164-32	.334	.250	.194	.1348	.1377
.190-32	.365	.250	.220	.1605	.1633
.190-24	.365	.335	.220	.1511	.1539
.250-28	.427	.285	.281	.2157	.2185
.250-20	.427	.400	.281	.2026	.2054
.312-24	.490	.335	.344	.2722	.2751
.312-18	.490	.445	.344	.2593	.2621
.375-24	.552	.335	.406	.3344	.3372
.375-16	.552	.500	.406	.3148	.3176
.437-20	.678	.400	.468	.3888	.3916
.437-14	.678	.570	.468	.3685	.3713

- Notes: 1/ Material: 300 series stainless steel.
2/ The nut minor diameter finish shall be 63 MI or better.
3/ Nut thread dimensions not listed in table VA shall conform to MIL-S-8879 for class 3B threads. Threads shall be cut not formed.
4/ For thread sizes above .437 diameter see table VB.
5/ Test nuts manufactured to MIL-F-18240 Revision E may be used until 1 year from the date of this specification. The test nuts specified in Revision E must be used in accordance with the requirements of Revision E.

MIL-DTL-18240F

TABLE VB. Dimensions of nuts required for qualification and conformance tests (inches) 1/ 2/ 3/ 4/ 5/

Thread size	Minimum width across flats	Nut thickness +/- .010	90-degree csink dia +/- .010	Thread Form	Minor Dia	
					Min	Max
.500-20	.740	.400	.531	UNF	.4484	.4514
				UNJF	.4537	.4567
.500-13	.740	.615	.531	UNC	.4212	.4242
				UNJC	.4295	.4325
.562-18	.865	.445	.593	UNF	.5048	.5078
				UNJF	.5110	.5140
.562-12	.865	.665	.593	UNC	.4767	.4797
				UNJC	.4849	.4879
.625-18	.927	.445	.656	UNF	.5675	.5705
				UNJF	.5734	.5764
.625-11	.927	.727	.656	UNC	.5316	.5346
				UNJC	.5405	.5434
.750-16	1.052	.625	.781	UNF	.6844	.6884
				UNJF	.6915	.6955
.750-10	1.052	.800	.781	UNC	.6463	.6503
				UNJC	.6566	.6606
.875-14	1.240	.655	.906	UNF	.8004	.8044
				UNJF	.8084	.8124
.875-9	1.240	.890	.906	UNC	.7596	.7636
				UNJC	.7715	.7755
1-12	1.427	.750	1.031	UNF	.9124	.9174
				UNJF	.9219	.9269
1-8	1.427	1.000	1.031	UNC	.8699	.8749
				UNJC	.8833	.8883
1.125-12	1.615	.812	1.156	UNF	1.0374	1.0424
				UNJF	1.0464	1.0514
1.250-12	1.812	.875	1.281	UNF	1.1624	1.1674
				UNJF	1.1714	1.1764

Notes: 1/ Material: 300 series stainless steel.

2/ The nut minor diameter finish shall be 63 MI or better.

3/ Nut thread dimensions not listed in table VB shall conform to MIL-S-8879 for class 3B threads. Threads shall be cut not formed.

4/ For thread sizes less than .500 diameter see table VA.

6/ Test nuts manufactured to MIL-F-18240 Revision E may be used until 1 year from the date of this specification. The test nuts specified in Revision E must be used in accordance with the requirements of Revision E

MIL-DTL-18240F

TABLE VI. Quality conformance inspection.

Examination or test	Requirement Paragraph	Test Paragraph
Group A		
Examination of product:	3.2	4.4.1
Presence of self-locking element		4.4.1a
Location of self-locking element	3.2.1	4.4.1b
Dimensions of self-locking element	3.2.1	4.4.1c
Presence of burrs and slivers	3.6	4.4.1d
Identification of product	3.5	4.4.1e
Group B		
Torque	3.3.1	4.4.2
Reusability	3.4	4.4.6

TABLE VII. Qualification tests.

Inspection	Requirement paragraph	Test method paragraph
Torque	3.3.1	4.4.2
High temperature torque	3.3.2	4.4.3
Off prevailing torque at maximum temperature	3.3.3	4.4.4
Vibration	3.3.4	4.4.5
Identification of product	3.5	4.4.1
Examination of product	3.2 & 3.6	4.4.1
Reusability	3.4	4.4.6

MIL-DTL-18240F

TABLE VIII. Basic color limits for self-locking element.

BASIC COLOR	LIMITS Per ASTM D1535
Blue	10.0B min., 8 Chroma min., 6 value min. 7.5PB max., 10 Chroma min., 4 value min. 2.5PB min., 10 Chroma min., 4 value min.
Green	10.0G max., 4 Chroma min., 4 value min. 7.5 G 4 Chroma min., 4 value min. 5.0 G min., 4 Chroma min., 4 value min.
Plum	5.0RP min., 8 Chroma min., 5 value max. 7.5RP 8 Chroma min., 5 value max. 10.0RP max., 8 Chroma min., 5 value max.
Yellow	10.0Y max., 2 Chroma min., 6 value min. 7.5 Y 2 Chroma min., 6 value min. 5.0 Y min., 2 Chroma min., 6 value min.
Red	10.0R max., 8 Chroma min., 5 value min. 7.5 R 8 Chroma min., 5 value min. 5.0 R min., 8 Chroma min., 5 value min.
White	N 9.5 max. / 90.0 % R N 7.25.min / 46.8 % R
Brown	2.5YR min., 4 Chroma min., 4 value max. 5.0YR 4 Chroma min., 4 value max. 7.5YR max., 4 Chroma min., 4 value max.

(See QPL-18240 for current approved sources)

MIL-DTL-18240F

Table IX Variables sampling for self-locking screw torque 1/ 2/.

LOT SIZE	SAMPLE NUMBER	SAMPLE SIZE	TOTAL	FIRST SAMPLE K_A	FIRST SAMPLE K_R	COMBINED SAMPLES K_T
UNDER 151	FIRST SECOND	4 8	4 12	2.42	1.35	1.72
151 THRU 300	FIRST SECOND	5 10	5 15	2.21	.89	1.74
301 THRU 500	FIRST SECOND	6 12	6 18	2.22	.94	1.70
501 THRU 1300	FIRST SECOND	7 14	7 21	2.32	1.10	1.78
1301 THRU 3200	FIRST SECOND	8 16	8 24	2.48	.99	1.81
OVER 3200	FIRST SECOND	10 20	10 30	2.34	1.31	1.80

- 1/ Evaluate each sample for on prevailing torque on the first cycle as follows:
 First sample: Accept if $\bar{X}_{MAXI} + K_A S_{MAXI} \leq M$. Reject if $\bar{X}_{MAXI} + K_R S_{MAXI} > M$.
 Take second sample if lot is not accepted or rejected.
 Second Sample: Accept if $\bar{X}_{MAXT} + K_T S_{MAXT} \leq M$. Reject if $\bar{X}_{MAXT} + K_T S_{MAXT} > M$.
- 2/ Evaluate each sample for off prevailing torque on the fifth cycle as follows:
 First sample: Accept if $\bar{X}_{MINI} - K_A S_{MINI} \geq L$. Reject if $\bar{X}_{MINI} - K_R S_{MINI} < L$.
 Take second sample if lot is not accepted or rejected.
 Second Sample: Accept if $\bar{X}_{MINT} - K_T S_{MINT} \geq L$. Reject if $\bar{X}_{MINT} - K_T S_{MINT} < L$.

Definition of terms:

- M = Maximum on prevailing torque specification limit per table II
 L = Minimum off prevailing torque specification limit per table II
 X_{MAXI} = Individual on prevailing torque values on the 1st cycle
 \bar{X}_{MAXI} = Average of X_{MAXI} values
 X_{MINI} = Individual off prevailing torque values on the 5th cycle
 \bar{X}_{MINI} = Average of X_{MINI} values

MIL-DTL-18240F

X_{MAXT} = Individual on prevailing torque values on the 1st cycle for combined samples

\bar{X}_{MAXT} = Average of X_{MAXT} values

X_{MINT} = Individual off prevailing torque values on the 5th cycle for combined samples

\bar{X}_{MINT} = Average of X_{MINT} values

N_1 = Number of parts in first sample

N_T = Number of parts in combined sample

$$S_{MAX1} = \sqrt{\frac{N_1 \sum X_{MAX1}^2 - (\sum X_{MAX1})^2}{N_1(N_1 - 1)}}$$

$$S_{MAXT} = \sqrt{\frac{N_T \sum X_{MAXT}^2 - (\sum X_{MAXT})^2}{N_T(N_T - 1)}}$$

$$S_{MIN1} = \sqrt{\frac{N_1 \sum X_{MIN1}^2 - (\sum X_{MIN1})^2}{N_1(N_1 - 1)}}$$

$$S_{MINT} = \sqrt{\frac{N_T \sum X_{MINT}^2 - (\sum X_{MINT})^2}{N_T(N_T - 1)}}$$

TABLE X Attribute plan for quality conformance torque tests.

Lot size	Sample Size	Acceptance number of failed parts
Under 10,000	10	0
10,000 through 50,000	15	0
50,001 through 100,000	20	0
Over 100,000	32	0

MIL-DTL-18240F

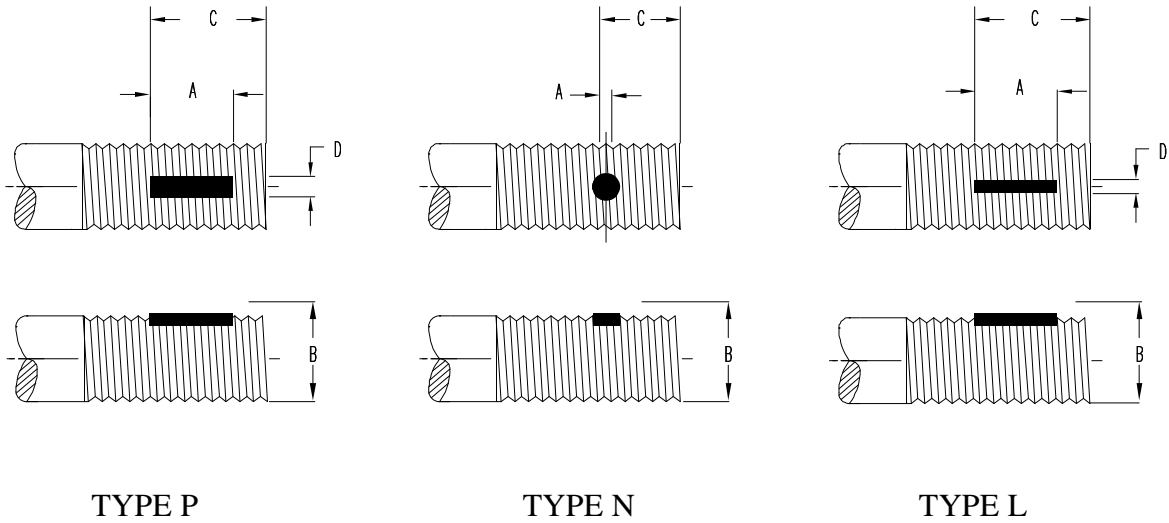


Figure 1. 250 degree F Self-locking elements for externally threaded fasteners.

CONCLUDING MATERIAL

Custodians:

Navy - AS
Air Force - 11
Army - AV

Preparing activity:

Navy - AS
(Project 53GP-0283)

Review activities:

Navy - OS
Air Force - 99
Army - AR, EA, MI
DLA - IS

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1. DOCUMENT NUMBER
MIL-DTL-18240F

2. DOCUMENT DATE (YYMMDD)
970602

3. DOCUMENT TITLE FASTENER ELEMENT, SELF-LOCKING, THREADED FASTENER, 250 DEG. F MAXIMUM

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)
(1) Commercial
(2) AUTOVON
(if applicable)

7. DATE SUBMITTED
(YYMMDD)

8. PREPARING ACTIVITY

a. NAME

COMMANDER, NAVAL AIR WARFARE CENTER,
AIRCRAFT DIVISION

b. TELEPHONE (Include Area Code)

(1) Commercial (2) AUTOVON
(908) 323-7488 624-7488

c. ADDRESS (Include Zip Code)

CODE 4.1.4
HIGHWAY 547
LAKEHURST, NJ 08733-5100

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DEFENSE QUALITY AND STANDARDIZATION OFFICE
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466
Telephone (703) 756-2340 AUTOVON 289-2340