



Designation: F594 – 22

Standard Specification for Stainless Steel Nuts¹

This standard is issued under the fixed designation F594; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers the requirements for stainless steel nuts 0.25 to 1.50 in., inclusive, in nominal diameter in a number of alloys in common use and intended for service applications requiring general corrosion resistance.

1.2 Seven groups of stainless steel alloys are covered, including ten austenitic, two ferritic, four martensitic, and one precipitation hardening.

Group	Alloys ^A	Condition ^B
1	304, 305, 304L 384, 18–9LW, 302HQ ^C	(CW) cold worked ^D
2	316, 316L	(CW) cold worked ^D
3	321, 347	(CW) cold worked ^D
4	430 ^E	(CW) cold worked ^D
5	410 ^F	(H) hardened and tempered
6	431	(H) hardened and tempered
7	630	(AH) aged hardened

^A Unless otherwise specified on the inquiry and order, the choice of an alloy from within a group shall be at the discretion of the fastener manufacturer (see 6.1).

^B See 4.2 for options.

^C When approved by the purchaser, alloys 303, 303Se, or XM1 may be furnished.

^D Sizes 0.75 in. and larger may be hot worked and solution annealed.

^E When approved by the purchaser, alloy 430F may be furnished.

^F When approved by the purchaser, alloy 416 or 416Se may be furnished.

1.3 Supplementary requirements of an optional nature are provided, applicable only when agreed upon by the manufacturer and the purchaser at the time of the inquiry and order.

1.4 Suitable bolts, hex cap screws, and studs for use with nuts included in this specification are covered by Specification F593. Unless otherwise specified, all bolts, hex cap screws, and studs used with these nuts shall conform to the requirements of Specification F593 and shall be of the same alloy group.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.04 on Nonferrous Fasteners.

Current edition approved Nov. 1, 2022. Published January 2023. Originally approved in 1978. Last previous edition approved in 2020 as F594 – 09(2020). DOI: 10.1520/F0594-22.

1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.7 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

- A262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
- A342/A342M Test Methods for Permeability of Weakly Magnetic Materials
- A380 Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
- A493 Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging
- A555/A555M Specification for General Requirements for Stainless Steel Wire and Wire Rods
- A564/A564M Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
- A582/A582M Specification for Free-Machining Stainless Steel Bars
- A751 Test Methods and Practices for Chemical Analysis of Steel Products
- D3951 Practice for Commercial Packaging
- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- F593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- F606/F606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

E1470 Test Method for Characterization of Proteins by Electrophoretic Mobility (Withdrawn 2014)³

2.2 ASME Standards:⁴

B1.1 Unified Inch Screw Threads

B18.2.2 Square and Hex Nuts

NOTE 1—The following ASTM standards are noted for information only as suitable sources of material for the manufacture of nuts to this specification:

Specifications A493, A564/A564M, and A582/A582M.

3. Ordering Information

3.1 Orders for nuts under this specification shall include the following:

3.1.1 Quantity (number of pieces of each item and size),

3.1.2 Name of item,

3.1.3 Size (diameter and threads per inch),

3.1.4 Alloy group number (see 6.2.1), and

3.1.5 Condition (see 4.2).

3.1.6 Orders for nuts under this specification may include the following optional requirements:

3.1.6.1 Forming (see 4.1.1),

3.1.6.2 Composition (see 6.2),

3.1.6.3 Corrosion resistance (see 8.1),

3.1.6.4 Thread class (see 9.2),

3.1.6.5 Finish (see 10.3),

3.1.6.6 Test report (see 17.2),

3.1.6.7 Rejection (see 16.1),

3.1.6.8 Test rejection (see 16.1), and

3.1.6.9 Special packaging (see 19.2).

3.1.7 Supplementary requirements, if any, to be specified on the order (see S1 through S8), and

3.1.8 ASTM specification and date of issue. When date of issue is not specified, fasteners shall be furnished to the latest issue.

NOTE 2—Example: 10 000 pieces, Hex Nut, 0.250 in. –20, Alloy Group 1, Condition CW, Furnish Test Report, Supplementary Requirement S3.

4. Manufacture

4.1 Manufacture:

4.1.1 *Forming*—Unless otherwise specified, the nuts shall be hot formed, cold formed, or machined from suitable material, at the option of the manufacturer.

4.2 *Condition*—The fasteners shall be furnished in the following conditions, unless specified to be furnished in one of the optional conditions:

Alloy Group	Condition Furnished Unless Otherwise Specified	Optional Conditions (must be specified)
1, 2, 3	CW	AF, A, SH
4	CW	A
5	H	HT
6	H	HT
7	AH	none
A—	Machined from annealed or solution annealed stock thus retaining the properties of the original material; or hot formed and solution annealed.	
AF—	Annealed after all threading is completed.	
AH—	Solution annealed and age hardened after forming.	
CW—	Annealed and cold worked. Sizes 0.75 in. and larger may be hot worked and solution annealed.	
H—	Hardened and tempered at 1050 °F (565 °C) minimum.	
HT—	Hardened and tempered at 525 °F (274 °C) minimum.	
SH—	Machined from strain hardened stock.	

5. Heat Treatment

5.1 *Alloy Groups 1, 2, and 3 (Austenitic Alloys 303, 303Se, 304, 304L, 305, 316, 316L, 321, 347, 384, XM1, 18–9LW, and 302HQ):*

5.1.1 *Condition A*—When Condition A is specified, the austenitic alloys shall be heated to 1900 ± 50 °F (1038 ± 28 °C), at which time the chromium carbide will go into the solution, be held for a sufficient time, and then be cooled at a rate sufficient to prevent precipitation of the carbide and to provide the specified properties.

5.1.2 *Condition CW*—When Condition CW is specified, the austenitic alloys shall be annealed as specified in 5.1.1 and then cold worked to develop the specified properties.

5.1.3 *Condition AF*—When Condition AF is specified, the austenitic alloys shall be annealed as specified in 5.1.1 after all cold working, including forming and threading.

5.2 *Alloy Group 4 (Ferritic Alloys 430 and 430F):*

5.2.1 *Condition A*—The ferritic alloys shall be heated to a temperature of 1450 ± 50 °F (788 ± 28 °C), held for an appropriate time, and then air cooled to provide the specified properties.

5.2.2 *Condition CW*—When Condition CW is specified, the ferritic alloys shall be annealed in accordance with 5.2.1, generally by the raw material manufacturer, and then cold worked to develop the specified properties.

5.3 *Alloy Group 5 (Martensitic Alloys 410, 416, and 416Se):*

5.3.1 *Condition H*—When Condition H is specified, the martensitic alloys 410, 416, and 416Se shall be hardened and tempered by heating to 1850 ± 50 °F (1010 ± 28 °C) sufficient for austenitization, held for at least ½ h and rapid air- or oil-quenched, then reheating to 1050 °F (565 °C) minimum for at least 1 h and air cooled to provide the specified properties.

5.3.2 *Condition HT*—When Condition HT is specified, the martensitic alloys 410, 416, and 416Se shall be hardened and tempered by heating to 1850 ± 50 °F (1010 ± 28 °C) sufficient for austenitization, held for at least ½ h and rapid air- or oil-quenched, then reheating to 525 °F (274 °C) minimum for at least 1 h and air cooled to provide the specified properties.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Global Engineering Documents, 15 Inverness Way, East Englewood, CO 80112-5704, <http://www.global.ihs.com>.