



Designation: **A563/A563M – 23**

Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric)¹

This standard is issued under the fixed designation A563/A563M; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

1. Scope*

1.1 This specification² covers chemical, mechanical, and dimensional requirements for eleven grades of carbon and alloy steel nuts for general structural and mechanical uses on bolts, studs, and other externally threaded parts.

NOTE 1—See **Appendix X1** for guidance on suitable application of nut grades.

1.2 The requirements for any grade of nut may, at the supplier's option, and with notice to the purchaser, be fulfilled by furnishing nuts of one of the stronger grades specified herein unless such substitution is barred in the inquiry and purchase order.

1.3 Terms used in this specification are defined in Terminology **F1789** unless otherwise defined herein.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.5 *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:³

¹ This specification is under the jurisdiction of ASTM Committee **F16** on Fasteners and is the direct responsibility of Subcommittee **F16.02** on Steel Bolts, Studs and Nuts.

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² For *ASME Boiler and Pressure Vessel Code* applications see related Specification SA – 563 in Section II of that Code.

³ 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.

A194/A194M Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

A307 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

A354 Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners

A394 Specification for Steel Transmission Tower Bolts, Zinc-Coated and Bare

A449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

A751 Test Methods and Practices for Chemical Analysis of Steel Products

B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

F606/F606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

F812 Specification for Surface Discontinuities of Nuts, Inch and Metric Series

F1136/F1136M Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners

F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

F1554 Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

F1789 Terminology for F16 Mechanical Fasteners

F1941/F1941M Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric

F2329/F2329M Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

F2833 Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type

F3019/F3019M Specification for Chromium Free Zinc-Flake Composite, with or without Integral Lubricant, Corrosion Protective Coatings for Fasteners

F3125/F3125M Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile

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



Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

F3148 Specification for High Strength Structural Bolt Assemblies, Steel and Alloy Steel, Heat Treated, 144ksi Minimum Tensile Strength, Inch Dimensions

F3393 Specification for Zinc-Flake Coating Systems for Fasteners

G101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

2.2 *ASME Standards*:⁴

ASME B1.1 Unified Screw Threads

ASME B18.2.2 Square and Hex Nuts

ASME B18.2.6 Fasteners for Use in Structural Applications

ASME B18.2.6M Metric Fasteners for Use in Structural Applications

ASME B1.13M Metric Screw Threads-M Profile

2.3 *SAE Standard*:⁵

SAE J995 Mechanical and Material Requirements for Steel Nuts

3. Ordering Information

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

3.1.1 Quantity (number of nuts),

3.1.2 Nominal size and thread series of nuts,

3.1.3 Style of nut (for example, heavy hex),

3.1.4 Grade of nut,

3.1.5 *Coatings or finishes*—If other than plain finish, specify the coating process or finish required, see 4.4 and **Annex A1**.

3.1.6 ASTM designation and year of issue, and

3.1.7 Any special observation or inspection requirements shall be specified at the time of inquiry and at the time of order. See 11.2.

3.1.8 Supplementary or special requirements.

NOTE 2—An example of an ordering description follows: 1000 7/8-9 heavy hex nuts, Grade DH, hot-dip zinc-coated, and lubricated, ASTM A563/A563M-XX.

4. Materials and Manufacture

4.1 Steel for nuts shall be made by the open-hearth, basic-oxygen, or electric-furnace process except that steel for Grades A and B nuts may be made by the acid-bessemer process.

4.2 *Manufacturing Method*:

4.2.1 Nuts may be made cold or hot by forming, pressing, or punching or may be machined from bar stock.

4.2.2 Threads shall be formed by tapping or machining.

4.3 *Heat Treatment*:

4.3.1 Grades DH, DH3, 10S, and 10S3 nuts shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 800 °F or 425 °C.

4.3.2 Grades C, C3, and D nuts made of any steel permitted for these grades may be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 800 °F or 425 °C.

4.4 *Coatings and Other Finishes*:

4.4.1 Permitted coatings, including supplementary lubrication and nut overlap requirements are provided in **Annex A1**.

4.4.2 When coated fasteners are required, the purchaser shall specify the process and any additional special requirements.

4.4.3 Hot-dip zinc coated nuts shall be installed with hot-dip zinc coated bolts. Hot-dip zinc coated nuts and bolts shall be coated per **F2329/F2329M**.

4.4.4 Mechanically deposited zinc coated nuts shall be installed with mechanically deposited zinc coated bolts. Mechanically deposited zinc coated nuts and bolts shall be coated per **B695**.

4.4.5 Hot-dip and mechanically deposited zinc and Zn/Al coating overlap allowances are specified in 7.3.

4.5 *Lubricant*:

4.5.1 Hot-dip and mechanically deposited zinc-coated Grade DH and 10S nuts shall be provided with an additional lubricant which shall be clean and dry to the touch (see Supplementary Requirement S1 to specify lubrication requirements for plain finish nuts).

4.5.2 See Supplementary Requirement S2 for option to specify a dye in the lubricant.

5. Chemical Composition

5.1 Grades A, B, C, D, DH, 8S, and 10S shall conform to the chemical composition specified in **Table 1**.

5.2 Grades C3, DH3, 8S3, and 10S3 shall be weathering steel and conform to the chemical composition specified in **Table 1**. Compositions A or B may be used for grades C3 and 8S3. Optionally, a chemical composition based on a corrosion index may be used provided the steel meets the chemical requirements in **Table 1** column headed “Based on Corrosion Index”. When certifying based on the corrosion index the steel shall have a corrosion index of 6 or greater, as calculated from the heat analysis, and as described in Guide **G101**, using the predictive method based on the data of Larabee and Coburn, or the predictive method based on the data of Townsend. See Guide **G101** for methods of estimating the atmospheric corrosion resistance of low alloy steels.

5.3 If performed, product analysis made on finished nuts representing each lot shall be within 10 % of the value required of the heat analysis. For example heat analysis C 0.30-0.52 = product analysis C 0.27-0.57.

5.4 Resulfurized or rephosphorized steel, or both, are not subject to rejection based on product analysis for sulfur or phosphorus.

5.5 Application of heats of steel to which bismuth, selenium, tellurium, or lead has been intentionally added shall not be permitted.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁵ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.