



Designation: F3125/F3125M – 23

Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength¹

This standard is issued under the fixed designation F3125/F3125M; 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.

1. Scope*

1.1 This specification covers chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel, in inch and metric dimensions, in two strength grades, two types and two styles.

1.1.1 This specification is a consolidation and replacement of six ASTM standards, including; A325, A325M, A490, A490M, F1852 and F2280.

1.1.2 This consolidated standard is to ensure alignment between standards with the same intended end use and to simplify the use and maintenance of structural bolt specifications.

1.2 Intended Use:

1.2.1 Bolts manufactured under this specification are intended for use in structural connections covered in the Specification for Structural Joints Using High-Strength Bolts, as approved by the Research Council on Structural Connections.

1.2.2 Bolts in this specification are furnished in sizes from 1/2 to 1-1/2 in. inclusive and from M12 to M36 inclusive.

1.3 Classification, Table 1:

1.3.1 Bolts are designated by grade, which indicates inch or metric strength and style.

1.3.2 Bolts are designated by type denoting raw material chemical composition.

1.3.3 Bolts are designated by style denoting Heavy Hex bolts or “Twist-Off” Style assemblies.

1.4 Terms used in this specification are defined in F1789.

1.5 *Units*—The values stated in either SI units or inch pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combin-

ing values from the two systems may result in non-conformance with the standard.

1.6 Table footnotes are requirements. Notes are advisory.

1.7 *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.*

1.8 *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

- A194/A194M Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
- A354 Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
- A449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
- A563/A563M Specification for Carbon and Alloy Steel Nuts (Inch and Metric)
- A751 Test Methods and Practices for Chemical Analysis of Steel Products
- B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- E709 Guide for Magnetic Particle Testing
- E1444/E1444M Practice for Magnetic Particle Testing for Aerospace

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 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

TABLE 1 Classification

Grade	Min. Strength	Type ^A		Style
A325	120 ksi	1	3	Heavy Hex Head
A490	150 ksi	1	3	Heavy Hex Head
F1852	120 ksi	1	3	Twist-Off
F2280	150 ksi	1	3	Twist-Off
A325M	830 MPa	1	3	Heavy Hex Head
A490M	1040 MPa	1	3	Heavy Hex Head

^A Type 1 - 120 ksi (830 MPa) - carbon steel, carbon boron steel, alloy steel or alloy steel with boron addition

Type 3 - 120 ksi (830 MPa) or 150 ksi (1040 MPa) - weathering steel

Type 1 - 150 ksi (1040 MPa) - alloy steel or alloy steel with boron addition

F436/F436M Specification for Hardened Steel Washers Inch and Metric Dimensions

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

F788 Specification for Surface Discontinuities of Bolts, Screws, Studs, and Rivets, 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

F1789 Terminology for F16 Mechanical Fasteners

F1940 Test Method for Process Control Verification to Prevent Hydrogen Embrittlement in Plated or Coated Fasteners

F2328 Test Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, Studs, and Nuts

F2328M Test Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, Studs, and Nuts (Metric)

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

F2660 Test Method for Qualifying Coatings for Use on F3125 Grade A490 Structural Bolts Relative to Environmental Hydrogen Embrittlement

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

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*:³

B1.1 Unified Screw Threads

B1.13M Metric Screw Threads

B18.18 Quality Assurance for Fasteners

B18.2.6 Fasteners for Use in Structural Applications

B18.2.6M Metric Fasteners for Use in Structural Applications

2.3 *IFI Standard*:⁴

IFI 144 Test Evaluation Procedures for Coating Qualification

2.4 *RCSC Standard*:⁵

Specification for Structural Joints Using High-Strength Bolts

3. Ordering Information

3.1 Orders for bolts under this specification shall include:

3.1.1 *ASTM designation*.

3.1.2 *Quantity*: Number of bolts or assemblies, including washers, if required.

3.1.3 *Size*: Including nominal bolt diameter and bolt length, and thread pitch if other than standard.

3.1.4 *Grade*: A325, A490, F1852, F2280 or A325M, A490M.

3.1.5 *Type*: Type 1 or Type 3. When Type is not specified either Type 1 or Type 3 may be furnished at the supplier's option.

3.1.6 *Style*: Heavy Hex or Twist-Off Style.

3.1.7 *Coatings or finishes*: If other than plain finish, specify the coating process or finish required, see **Annex A1**.

3.2 *Test reports*, see Section 14.

3.3 Additional details of other assembly components such as nuts and washers, if required.

3.4 Rotational capacity testing of matched sets or assemblies in accordance with **Annex A2**, as required in 8.1.5 and when requested by the purchaser.

3.5 Heavy Hex bolts may be ordered individually, packaged with nuts, packaged with nuts and washers, or as assemblies.

3.6 Any special observation or inspection requirements shall be specified at the time of inquiry and at the time of order. See Section 13.2.

3.7 Any supplementary requirements.

3.8 Country of origin requirements, if any.

NOTE 1—A typical description follows: 1000 pieces ¾ in.× 3 in. ASTM F3125–19, Grade A325 Heavy Hex Bolt, Type 1, each with one ASTM **F436/F436M** Type 1 Hardened Washer, and one **A563/A563M** Grade DH Heavy Hex Nut.

NOTE 2—Bolts are sometimes detailed with names such as A325 HS, A325 SC, A325 X or A490 N. These names relate to connection design and bolt installation, but do not change the manufacturing requirements and are preferably not shown on bolt orders.

4. Dimensions

4.1 *Head and Body*:

4.1.1 Bolts shall conform to the dimensions specified in **Table 2** for Heavy Hex or Twist-Off bolts.

4.1.2 The thread length shall not be changed except as provided in Supplementary Requirement S1 or S2. Other dimensions shall not be changed except in accordance with Supplementary Requirement S2.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Industrial Fasteners Institute (IFI), 6363 Oak Tree Blvd. Independence, OH 44131. <http://www.indfast.org>

⁵ Research Council on Structural Connections (RCSC), <http://boltcouncil.org>