



Designation: A320/A320M – 24

Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service¹

This standard is issued under the fixed designation A320/A320M; 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 alloy and stainless steel bolting materials and bolting components for pressure vessels, valves, flanges, and fittings for low-temperature service. See Specification [A962/A962M](#) for the definition of bolting. The bars shall be hot-wrought and may be further processed by centerless grinding or by cold drawing. Austenitic stainless steel may be solution annealed or annealed and strain-hardened. When strain hardened austenitic stainless steel is ordered, the purchaser should take special care to ensure that [Appendix X1](#) is thoroughly understood.

1.2 Several grades are covered, including both ferritic and austenitic steels designated L7, B8, etc. Selection will depend on design, service conditions, mechanical properties, and low-temperature characteristics. The mechanical requirements of [Table 1](#) indicate the diameters for which the minimum mechanical properties apply to the various grades and classes, and [Table 2](#) stipulates the requirements for Charpy impact energy absorption. The manufacturer should determine that the material can conform to these requirements before parts are manufactured. For example, when Grade L43 is specified to meet the [Table 2](#) impact energy values at -150°F [-101°C], additional restrictions (such as procuring a steel with lower P and S contents than might normally be supplied) in the chemical composition for AISI 4340 are likely to be required.

NOTE 1—The committee formulating this specification has included several grades of material that have been rather extensively used for the present purpose. Other compositions will be considered for inclusion by the committee from time to time as the need becomes apparent. Users should note that hardenability of some of the grades mentioned may restrict the maximum size at which the required mechanical properties are obtainable.

¹ This specification is under the jurisdiction of ASTM Committee [A01](#) on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee [A01.22](#) on Steel Forgings and Wrought Fittings for Piping Applications and Bolting Materials for Piping and Special Purpose Applications.

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² For ASME Boiler and Pressure Vessel Code applications, see related Specification SA-320 in Section II of that Code.

1.3 The following referenced general requirements are indispensable for application of this specification: Specification [A962/A962M](#).

1.4 Nuts for use with bolting are covered in Section [10](#) and the nut material shall be impact tested.

1.5 Supplementary Requirements are provided for use at the option of the purchaser. The supplementary requirements shall apply only when specified in the purchase order or contract.

1.6 This specification is expressed in both inch-pound units and SI units; however, unless the purchase order or contract specifies the applicable *M* specification designation (SI) units, the inch-pound units shall apply.

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

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:³

[A194/A194M](#) Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

[A962/A962M](#) Specification for Common Requirements for Bolting Intended for Use at Any Temperature from Cryogenic to the Creep Range

[E566](#) Practice for Electromagnetic (Eddy Current/Magnetic Induction) Sorting of Ferrous Metals

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.

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



TABLE 1 Mechanical Requirements

Class and Grade, Diameter, in. [mm]	Heat Treatment	Minimum Tempering Temperature, °F [°C]	Tensile Strength, min, ksi [MPa]	Yield Strength, min, ksi [MPa] (0.2 % offset)	Elongation in 2 in. or 50 mm, min, %	Reduction of Area, min, %	Hardness, max
Ferritic Steels							
L7, L7A, L7B, L7C, L70, L71, L72, L73			125	105	16	50	321 HBW or 35 HRC
2½ [65] and under ^A	quenched and tempered	1100 [593]	[860]	[725]			
L43			125	105	16	50	321 HBW or 35 HRC
4 [100] and under ^A	quenched and tempered	1100 [593]	[860]	[725]			
L7M			100	80	18	50	235 HBW ^B or 99 HRB
2½ [65] and under ^A	quenched and tempered	1150 [620]	[690]	[550]			
L1			125	105	16	50	...
1 [25] and under ^A	quenched and tempered		[860]	[725]			
Austenitic Steels ^C							
Class 1: B8, B8C, B8M, B8P, B8F, B8T, B8LN, B8MLN, all diameters	carbide solution treated		75	30	30	50	223 HBW ^D or 96 HRB
Class 1A: B8A, B8CA, B8MA, B8PA, B8FA, B8TA, B8LNA, B8MLNA, all diameters	carbide solution treated in the finished condition		[515] 75 [515]	[205] 30 [205]	30	50	192 HBW or 90 HRB
Class 2: B8, B8C, B8P, B8F, B8T: ¾ [20] and under	carbide solution treated and strain hardened		125	100	12	35	321 HBW or 35 HRC
over ¾ to 1 [20 to 25], incl			[860] 115 [795]	[690] 80 [550]	15	35	321 HBW or 35 HRC
over 1 to 1¼ [25 to 32], incl			105	65	20	35	321 HBW or 35 HRC
over 1¼ to 1½ [32 to 40], incl ^A			[725] 100 [690]	[450] 50 [345]	28	45	321 HBW or 35 HRC
Class 2: B8M:	carbide solution treated and strain hardened						
¾ [20] and under			110	95	15	45	321 HBW or 35 HRC
over ¾ to 1 [20 to 25], incl			[760] 100 [690]	[655] 80 [550]	20	45	321 HBW or 35 HRC
over 1 to 1¼ [25 to 32], incl			95	65	25	45	321 HBW or 35 HRC
over 1¼ to 1½ [32 to 40], incl ^A			[655] 90 [620]	[450] 50 [345]	30	45	321 HBW or 35 HRC

^A These upper diameter limits were established on the basis that these were the largest sizes commonly available that consistently met specification property limits. They are not intended as absolute limits beyond which bolting materials could no longer be certified to the specification.

^B To meet the tensile requirements, the Brinell hardness shall not be less than 200 HBW or 93 HRB.

^C Class 1 products are made from solution-treated material. Class 1A products are solution treated in the finished condition for corrosion resistance; heat treatment is critical for enhancing this physical property and meeting the mechanical property requirements. Class 2 products are made from solution-treated material that has been strain hardened. Austenitic steels in the strain-hardened condition may not show uniform properties throughout the cross section, particularly in sizes over ¾ in. [20 mm] in diameter.

^D For sizes ¾ in. [20 mm] in diameter and smaller, a maximum hardness of 241 HBW (100 HRB) is permitted.