



Designation: A1082/A1082M – 16 (Reapproved 2021)

Standard Specification for High Strength Precipitation Hardening and Duplex Stainless Steel Bolting for Special Purpose Applications¹

This standard is issued under the fixed designation A1082/A1082M; 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 high strength stainless steel bolting materials and bolting components for special purpose applications such as pressure vessels. Several grades of precipitation-hardened and duplex (ferritic-austenitic) stainless steels are covered. Selection will depend upon design, service conditions, mechanical properties and characteristics related to the application.

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

1.3 Supplementary Requirements are provided for use at the option of the purchaser. The Supplementary Requirements shall only apply when specified individually by the purchaser in the purchase order or contract.

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

1.5 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. 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.

1.6 *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 standard-*

ization 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

[A276/A276M](#) Specification for Stainless Steel Bars and Shapes

[A370](#) Test Methods and Definitions for Mechanical Testing of Steel Products

[A479/A479M](#) Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels

[A564/A564M](#) Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes

[A959/A959M](#) Guide for Specifying Harmonized Standard Grade Compositions for Wrought Stainless Steels

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

2.2 ASNT Documents:³

[ASNT SNT-TC-1A](#) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

3. Ordering Information

3.1 The inquiry and order shall indicate the following, as required, to describe the desired material adequately:

3.1.1 Quantity (weight or number of pieces),

3.1.2 Description of item (bars, bolts, nuts, etc.),

3.1.3 UNS Designation or Type (see [Table 1](#)),

3.1.4 Heat-Treat Condition (see [7.1.1](#)),

3.1.5 Dimension/Threads, etc. (see the section in Specification [A962/A962M](#) titled “Workmanship, Finish, and Appearance”), and

3.1.6 Supplementary Requirements, if any.

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 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.

³ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

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

TABLE 1 Chemical Requirements^A

UNS Designation ^B	Type ^B	Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Other Elements
Duplex (Ferritic-Austenitic) Grades											
S31100	...	0.06	1.00	0.045	0.030	1.00	25.0-27.0	6.0-7.0	...	...	Ti 0.25
S31260	...	0.030	1.00	0.030	0.030	0.75	24.0-26.0	5.5-7.5	2.5-3.5	0.10-0.30	Cu 0.20-0.80, W 0.10-0.50
S31803	...	0.030	2.00	0.030	0.020	1.00	21.0-23.0	4.5-6.5	2.5-3.5	0.08-0.20	...
S32101	...	0.040	4.0-6.0	0.040	0.030	1.00	21.0-22.0	1.35-1.70	0.10-0.80	0.20-0.25	Cu 0.10-0.80
S32202	...	0.030	2.00	0.040	0.010	1.00	21.5-24.0	1.0-2.80	0.45	0.18-0.26	...
S32205	2205	0.030	2.00	0.030	0.020	1.00	22.0-23.0	4.5-6.5	3.0-3.5	0.14-0.20	...
S32304	2304	0.030	2.50	0.040	0.030	1.00	21.5-24.5	3.0-5.5	0.05-0.60	0.05-0.20	Cu 0.05-0.60
S32506	...	0.030	1.00	0.040	0.015	0.90	24.0-26.0	5.5-7.2	3.0-3.5	0.08-2.0	W 0.05-0.30
S32550	255	0.040	1.50	0.040	0.030	1.00	24.0-27.0	4.5-6.5	2.9-3.9	0.10-0.25	Cu 1.50-2.50
S32750	2507	0.030	1.20	0.035	0.020	0.80	24.0-26.0	6.0-8.0	3.0-5.0	0.24-0.32	Cu 0.50
S32760	...	0.030	1.00	0.030	0.010	1.00	24.0-26.0	6.0-8.0	3.0-4.0	0.20-0.30	Cu 0.50-1.00, W 0.50-1.00, %Cr+3.3x%Mo +16x%N≥40
S32906	...	0.030	0.80-1.50	0.030	0.030	0.50	28.0-30.0	5.8-7.5	1.50-2.60	0.30-0.40	Cu 0.80
S32950	...	0.030	2.00	0.035	0.010	0.60	26.0-29.0	3.5-5.2	1.00-2.50	0.15-0.35	...
S39277	...	0.025	0.80	0.025	0.002	0.80	24.0-26.0	6.5-8.0	3.0-4.0	0.23-0.33	Cu 1.20-2.00, W 0.80-1.20
Precipitation Hardening Grades											
S15700	632	0.09	1.00	0.040	0.030	1.00	14.0-16.0	6.5-7.7	2.00-3.00	...	Al 0.75-1.50
S17400	630	0.07	1.00	0.040	0.030	1.00	15.0-17.0	3.0-5.0	...	...	Cu 3.0-5.0, Cb +Ta 0.15-0.45
S17600	635	0.08	1.00	0.040	0.030	1.00	16.0-17.5	6.0-7.5	...	...	Al 0.40, Ti 0.40-1.20
S17700	631	0.09	1.00	0.040	0.030	1.00	16.0-18.0	6.5-7.7	...	...	Al 0.75-1.50
S35500	634	0.10-0.15	0.50-1.25	0.040	0.030	0.50	15.0-16.0	4.0-5.0	2.5-3.2	0.07-0.13	Cb 0.10-0.50

^A Maximum or range unless otherwise indicated.

^B See Guide [A959/A959M](#).

TABLE 2 Solution Treatment and Mechanical Property Requirements for PH Grades^A

UNS Designation	Type	Solution Treatment ^{B,C} °F [°C]	Mechanical Property Requirements in the Solution Treated Condition					Hardness ^D	
			Tensile Strength ksi [MPa]	Yield Strength ksi [MPa]	Elongation in 2" [50 mm] or 4D, min. %	Reduction of Area, min. %	Rockwell, maximum	Brinell, maximum	
S15700	632	...	...	...	...	...	100 HRB	269
S17400	630	Cool to below 90 [32]	...	...	...	...	38 HRC	363
S17600	635	Air Cool	120 [825]	75 [515]	10	45	32 HRC	302	
S17700	631	...	...	...	...	...	98 HRB	229
S35500	634	Hold at ≤ -100 [-73] for at least 3 hours	...	...	...	...	...	363

^A Values shown are minimums or ranges unless maximum is indicated.

^B 1900 [1040] ± 25°F [15°C].

^C Quenched in water unless the table specifies another media.

^D Either Rockwell or Brinell testing is permitted unless thickness is below ½" in which case Rockwell is preferred.

4. Common Requirements

4.1 Bolting materials and components supplied to this specification shall conform to the requirements of Specification [A962/A962M](#). These requirements include test methods, finish, thread dimensions, marking, terminology, testing, certification, optional supplementary requirements, and others. Failure to comply with the requirements of Specification [A962/A962M](#) constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification [A962/A962M](#), this specification shall prevail.

5. Materials and Manufacture

5.1 Bars shall be produced in accordance with Specifications [A276/A276M](#), [A479/A479M](#) or [A564/A564M](#) as applicable. Finish (hot or cold, ground, rough turned, drawn, etc.) shall be at the option of the manufacturer unless otherwise specified in the purchase order or contract.

5.2 Bolting components shall be produced in accordance with this specification and the requirements of Specification [A962/A962M](#).