



Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar¹

This standard is issued under the fixed designation A666/A666M; 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 specification covers austenitic stainless steels in the annealed and normally required cold-worked conditions for various structural, pressure vessel, magnetic, cryogenic, and heat-resisting applications.

1.2 The application of this specification, or the use of material covered by this specification does not automatically allow usage in pressure vessel applications. Only annealed conditions of grades specifically approved by the ASME code are permitted for pressure vessel use.

1.3 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. 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.

1.4 *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.*

1.5 *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.*

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 A01.17 on Flat-Rolled and Wrought Stainless Steel.

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2. Referenced Documents

2.1 ASTM Standards:²

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

A484/A484M Specification for General Requirements for Stainless Steel Bars, Billets, Shapes, and Forgings

A751 Test Methods and Practices for Chemical Analysis of Steel Products

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

A1058 Test Methods for Mechanical Testing of Steel Products—Metric

E6 Terminology Relating to Methods of Mechanical Testing

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 SAE International³

SAE J 1086 Numbering Metals and Alloys

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms pertaining to this standard reference should be made to Terminology A941.

3.1.2 For definitions of terms pertaining to plate, sheet, and strip reference should be made to Specification A480/A480M.

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

3.1.3 For definitions of terms pertaining to flat bar reference should be made to Specification **A484/A484M**.

3.1.4 For definitions of terms pertaining to methods of mechanical testing reference should be made to Specification **E6**.

4. Material Test Report and Certification

4.1 In addition to the requirements of Specification **A480/A480M** for plate, sheet, and strip or Specification **A484/A484M** for flat bar, the cold-worked condition (annealed, $\frac{1}{4}$ H, $\frac{1}{2}$ H, and so forth) shall be noted.

5. Chemical Composition

5.1 The steel shall conform to the chemical composition requirements specified in **Table 1**, and shall conform to applicable requirements specified in the current edition of Specification **A480/A480M** for plate, sheet, and strip or Specification **A484/A484M** for flat bar.

6. Mechanical Properties

6.1 The material shall conform to the mechanical properties specified in **Tables 2 and 3**, or **Tables 2 and 4**. This specification defines minimum properties only and does not imply a range. Depending on the work hardening characteristics of the particular grade, either the yield or the tensile strength can be the controlling factor in meeting the properties. The noncontrolling factor normally will exceed considerably the specified minimum.

7. General Requirements

7.1 The following requirements for orders for material furnished under this specification shall conform to the applicable requirements of the current edition of Specification **A480/A480M** or Specification **A484/A484M**:

- 7.1.1 Definitions,
- 7.1.2 General requirements for delivery,
- 7.1.3 Ordering information,
- 7.1.4 Process,
- 7.1.5 Special tests,
- 7.1.6 Heat treatment,
- 7.1.7 Dimensions and permissible variations,
- 7.1.8 Workmanship, finish and appearance,
- 7.1.9 Number of tests/test methods,
- 7.1.10 Specimen preparation,
- 7.1.11 Retreatment,
- 7.1.12 Inspection,
- 7.1.13 Rejection and rehearing,
- 7.1.14 Material test report,
- 7.1.15 Certification, and
- 7.1.16 Packaging, marking, and loading.

8. Sampling

8.1 Tension and bend-test specimens of sheet, strip, and plate products shall be selected from finished material and shall be selected in the transverse direction, except in the case of strip under 9 in. (230 mm) in width, in which case tension test specimens shall be selected in the longitudinal direction.

8.2 Flat bar tension and bend-test specimens shall be selected from the finished material and shall be in the longitudinal direction.

8.3 Corrosion samples, if required, shall be taken from material after final annealing and descaling and prior to cold working.

9. Number of Tests

9.1 For cold-worked product produced in coil form, one tension test shall be made from each end of each coil. One bend test shall be made from one end of each coil.

9.2 For cold-worked flat bar and plate products, two tension test and one bend test shall be made on each size of flat bar and each thickness of plate from each heat in a lot annealed in a single charge or under the same conditions in a continuous furnace.

9.3 Annealed material produced to **Table 2** requirements shall be tested in accordance with Specification **A480/A480M**.

10. Test Methods

10.1 Tension Test:

10.1.1 The yield strength shall be determined by the offset method as described in Test Methods and Definitions **A370** or Test Methods **A1058**. An alternative method of determining yield strength may be used based on the following total extension under load:

Yield Strength, min. ksi [MPa]	Total Extension under Load in 2 in. or [50 mm] Gauge Length, incl. in./in. [mm/mm]
45 [310]	0.0071
75 [515]	0.0098
110 [760]	0.0125
135 [930]	0.0144
140 [965]	0.0148

10.1.2 The requirement of this specification for yield strength will be considered as having been fulfilled if the extension under load for the specified yield strength does not exceed the specified values. The values obtained in this manner should not, however, be taken as the actual yield strength for 0.2 %. In case of dispute, the offset method of determining yield strength shall be used.

10.2 Bend Test:

10.2.1 Bend-test specimens shall withstand cold bending without cracking when subjected to either the free-bend method or the controlled-bend (V-block) method at the condition specified by **Table 3** or **Table 4**, respectively. Specimens shall be bent around a diameter equal to the product of the bend factor times the specified thickness of the test specimen. The choice of test method for materials in conditions other than annealed shall be at the option of the seller.

10.2.2 Free-bend test specimens shall be bent cold, either by pressure or by blows. However, in the case of dispute, tests shall be made by pressure.

10.2.3 Controlled-bend (V-block) test specimens shall be bent cold by means of V-blocks or a mating punch and die having an included angle of 45° and with proper curvature of surface at the bend areas to impart the desired shape and diameter of bend to the specimen.