



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 5863A

Superseding AMS 5863

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STEEL SHEET, STRIP, AND PLATE, CORROSION RESISTANT
15Cr - 6.5Ni - 0.75Mo - 0.6(Cb+Ta) - 1.5Cu
Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a corrosion-resistant steel in the form of sheet, strip, and plate.

1.2 Application: Primarily for parts requiring corrosion resistance and high strength in service up to 700°F (370°C). Product can be used in the solution heat treated condition and is capable of being precipitation heat treated to tensile strengths as high as 180,000 psi (1241 MPa).

1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking after precipitation heat treatment; ARP 1110 recommends practices to minimize such conditions.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) and Aerospace Recommended Practices (ARP) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2242 - Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate

AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock

2.1.2 Aerospace Recommended Practices:

ARP 1110 - Minimizing Stress Corrosion Cracking in Heat Treatable Wrought Low Alloy and Martensitic Corrosion Resistant Steels

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A370 - Mechanical Testing of Steel Products

ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade or their use by governmental agencies is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Carbon	--	0.05
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.030
Sulfur	--	0.030
Chromium	14.00	16.00
Nickel	6.00	7.00
Molybdenum	0.50	1.00
Columbium + Tantalum	8xC	1.00
Copper	1.25	1.75

- 3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

- 3.2 Condition: The product shall be supplied in the following condition:

- 3.2.1 Sheet: Cold rolled, solution heat treated, and descaled (No. 2D Finish).

- 3.2.2 Strip: Cold rolled, solution heat treated, and descaled (No. 1 Strip Finish).

- 3.2.3 Plate: Hot rolled, solution heat treated, and descaled.

- 3.3 Heat Treatment: The product shall be solution heat treated by heating to $1900^{\circ}\text{F} \pm 25$ ($1040^{\circ}\text{C} \pm 15$), holding at heat for 5 - 30 min., and quenching as required. Plate over 1.250 in. (31 mm) in nominal thickness shall be water or oil quenched.

- 3.4 Properties: The product shall conform to the following requirements; tensile, hardness, and bend testing shall be performed in accordance with ASTM A370:

3.4.1 As Solution Heat Treated:3.4.1.1 Tensile Properties:

Tensile Strength, min	125,000 psi (862 MPa)
Yield Strength at 0.2% Offset, min	95,000 psi (655 MPa)
Elongation in 2 in. (50 mm) or 4D, min	4%

- 3.4.1.2 Hardness: Product 0.010 in. (0.25 mm) and over in nominal thickness should have hardness not higher than 33 HRC or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.1.1 are met.

3.4.1.3 Bending: Product under 0.1875 in. (4.75 mm) in nominal thickness shall withstand, without cracking, free bending through an angle of 180 deg around a diameter equal to 6 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

3.4.1.3.1 Bending requirements for product 0.1875 in. (4.75 mm) and over in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2 After Precipitation Heat Treatment: The product shall conform to the following requirements after being precipitation heat treated by heating to $900^{\circ}\text{F} \pm 15$ ($480^{\circ}\text{C} \pm 8$), holding at heat for 4 to 8 hr, and cooling in air:

3.4.2.1 Tensile Properties: Shall be as specified in Table I:

TABLE I

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.020, incl	180,000	170,000	3
Over 0.020 to 0.062, incl	180,000	170,000	4
Over 0.062	180,000	170,000	5

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D, %, min
Up to 0.50, incl	1241	1172	3
Over 0.50 to 1.55, incl	1241	1172	4
Over 1.55	1241	1172	5

3.4.2.2 Hardness: Product 0.010 in. (0.25 mm) and over in nominal thickness should have hardness not lower than 40 HRC or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.2.1 are met.

3.4.3 After Other Precipitation Heat Treatment: Properties after precipitation heat treatment at temperatures other than $900^{\circ}\text{F} \pm 15$ ($480^{\circ}\text{C} \pm 8$) shall be as agreed upon by purchaser and vendor.

3.5 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2242.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling: Shall be in accordance with AMS 2371 and the following:

4.3.1 Specimens for tensile tests of widths 9 in. (225 mm) and over shall be taken with the axis of the specimen perpendicular to the direction of rolling; for widths less than 9 in. (225 mm), specimens shall be taken with the axis parallel to the direction of rolling.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and the results of tests on each lot to determine conformance to the other technical requirements of this specification. This report shall include the purchase order number, heat number, AMS 5863A, size, and quantity from each heat.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 5863A, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

0 4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet, strip, and plate shall be marked on one face, in the respective location indicated below, with AMS 5863A, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1 Flat Strip 6 In. (150 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm).

5.1.2 Flat Sheet, Flat Strip Over 6 In. (150 mm) in Width, and Plate: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm), the rows being spaced not more than 6 in. (150 mm) apart and alternately staggered.

5.1.3 Coiled Sheet and Strip: Shall be marked near both the outside and inside ends of the coil; the markings shall be applied as in 5.1 or shall appear on a durable tag or label attached to the coil and marked with the information of 5.1. When the inside end of the coil is inaccessible, as when the product is wound on cores, the tag or label may be attached to the core.

5.2 Packaging:

0 5.2.1 The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.