



AEROSPACE MATERIAL SPECIFICATION

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

AMS 5520B

Superseding AMS 5520A

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STEEL SHEET, STRIP, AND PLATE, CORROSION AND MODERATE HEAT RESISTANT
15Cr - 7.1Ni - 2.5Mo - 1.1Al

1. SCOPE:

- 1.1 Form: This specification covers a corrosion and moderate heat resistant, precipitation-hardenable steel in the form of sheet, strip, and plate.
- 1.2 Application: Primarily for parts requiring corrosion resistance and high strength up to 600° F (315° C), and where such parts may require welding during fabrication. Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; 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 Materials 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.

2.3.1 Federal Standards:

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

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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	--	0.09
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	14.00 - 16.00	
Nickel	6.50 - 7.75	
Molybdenum	2.00 - 3.00	
Aluminum	0.75 - 1.50	

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 as in 3.3, and descaled (No. 2D Finish).

3.2.2 Strip: Cold rolled, solution heat treated as in 3.3, and descaled (No. 1 Strip Finish).

3.2.3 Plate: Hot rolled, solution heat treated as in 3.3, and descaled.

3.3 Solution Heat Treatment: The product shall be solution heat treated by heating to 1950° F ± 25 (1065° C ± 15), holding at heat for not less than 3 min. per 0.1 inch (25 mm) of nominal thickness, and cooling in air.

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: Shall be as follows:

Tensile Strength, max	150,000 psi (1034 MPa)
Yield Strength at 0.2% Offset, max	65,000 psi (448 MPa)
Elongation in 2 in. (50 mm) or 4D, min	25%

3.4.1.2 Hardness: Should be not higher than 100 HRB 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 0.275 in. (6.98 mm) and under in nominal thickness shall withstand, without cracking, bending through the angle indicated below around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling. Only one type of test will be required in routine inspection; in case of dispute, results of tests using the V-block procedure shall govern.

Nominal Thickness		Type of Bend	Angle deg, min	Bend Factor
Inch	(Millimetres)			
Up to 0.187, incl	(Up to 4.75, incl)	Free Bend	180	1
		V-Block	135	1
Over 0.187 to 0.275, incl	(Over 4.75 to 6.98, incl)	Free Bend	180	3
		V-Block	135	3

3.4.1.3.1 Bending requirements for plate over 0.275 in. (6.98 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2 As Austenite Conditioned and Precipitation Heat Treated: The product shall have the following properties after being austenite conditioned by heating to 1400° F ± 25 (760° C ± 15), holding at heat for 90 min. ± 5, cooling to 55° F ± 5 (13° C ± 3) within 60 min., holding at that temperature for not less than 30 min., and precipitation heat treated by heating to 1050° F ± 10 (565° C ± 5), holding at heat for 90 min. ± 5, and cooling to room temperature:

3.4.2.1 Product 0.0015 to 0.500 In. (0.038 to 12.70 mm), Incl, in Nominal Thickness:

3.4.2.1.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D, %, min
0.0015 to 0.005, excl	190,000	170,000	2
0.005 to 0.010, excl	190,000	170,000	3
0.010 to 0.020, excl	190,000	170,000	4
0.020 to 0.1875, excl	190,000	170,000	5
0.1875 to 0.500, incl	190,000	170,000	6

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
0.038 to 0.13, excl	1311	1174	2
0.13 to 0.25, excl	1311	1174	3
0.25 to 0.51, excl	1311	1174	4
0.51 to 4.762, excl	1311	1174	5
4.762 to 12.70, incl	1311	1174	6

3.4.2.1.2 Hardness: Should be 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 3.4.2.1.1 are met.

3.4.2.2 Product Over 0.500 In. (12.70 mm) in Nominal Thickness: Tensile property and hardness requirements shall be as agreed upon by purchaser and vendor.

3.4.3 As Austenite Conditioned, Sub-Zero Transformed, and Precipitation Heat Treated: The product shall have the following properties after being austenite conditioned by heating to 1750° F ± 25 (955° C ± 15), holding at heat for not less than 10 min., rapidly cooling to room temperature, sub-zero transformed by cooling to -100° F ± 10 (-73° C ± 5), holding at that temperature for not less than 8 hr, warming in air to room temperature, and precipitation heat treated by heating to 950° F ± 10 (510° C ± 5), holding at heat for 60 min. ± 5, and cooling to room temperature:

3.4.3.1 Product 0.0015 to 0.500 In. (0.038 to 12.70 mm), Incl, in Nominal Thickness:

3.4.3.1.1 Tensile Properties: Shall be as specified in Table II.

TABLE II

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
0.0015 to 0.005, excl	225,000	200,000	1
0.005 to 0.010, excl	225,000	200,000	2
0.010 to 0.020, excl	225,000	200,000	3
0.020 to 0.1875, excl	225,000	200,000	4
0.1875 to 0.500, incl	225,000	200,000	5

TABLE II (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D %, min
0.038 to 0.13, excl	1590	1442	1
0.13 to 0.25, excl	1590	1442	2
0.25 to 0.51, excl	1590	1442	3
0.51 to 4.762, excl	1590	1442	4
4.762 to 12.70, incl	1590	1442	5

3.4.3.1.2 Hardness: Should be not lower than 45 HRC or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.3.1.1 are met.

3.4.3.2 Product Over 0.500 In. (12.70 mm) in Nominal Thickness: Tensile property and hardness requirements 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, clean, 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.