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400 COMMONWEALTH DRIVE WARRENDALE PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5603C
Superseding AMS 5603B

Issued 5-1-68
Revised 7-1-84

STEEL SHEET AND STRIP, CORROSION AND MODERATE HEAT RESISTANT
15Cr - 8.4Ni - 2.2Mo - 1.1Al
Vacuum Induction Melted, Solution Heat Treated

UNS S14800

1. SCOPE:

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

1.2 Application: Primarily for parts requiring corrosion resistance, high strength, high fracture toughness, and oxidation resistance up to 800°F (425°C). Such parts may require welding or brazing during fabrication. Certain processing procedures and service conditions may cause these products to be subject 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 SAE, 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 E338 - Sharp-Notch Tension Testing of High-Strength Sheet Materials
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

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	--	0.10
Silicon	--	0.10
Phosphorus	--	0.010
Sulfur	--	0.008
Chromium	14.75	15.50
Nickel	8.00	8.75
Molybdenum	2.00	2.50
Aluminum	0.90	1.35
Nitrogen	--	0.01 (100 ppm)

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).

3.3 Solution Heat Treatment: The product shall be solution heat treated by heating to 1825°F ± 25 (995°C ± 15), holding at heat for not less than 3 min. per 0.10 in. (2.5 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:

3.4.1.1.1 Product 0.005 In. (0.13 mm) and Over in Thickness:

	Tensile Strength, max	150,000 psi (1035 MPa)
Ø	Yield Strength at 0.2% Offset, max	65,000 psi (450 MPa)
	Elongation in 2 in. (50 mm), min	20%

3.4.1.1.2 Product Under 0.005 In. (0.13 mm) in Thickness: As agreed upon by purchaser and vendor.

3.4.1.2 Hardness:

3.4.1.2.1 Product Over 0.010 In. (0.25 mm) in Thickness: Not higher than 100 HRB or equivalent.

3.4.1.2.2 Product 0.010 In. (0.25 mm) and Under in Thickness: As agreed upon by purchaser and vendor.

3.4.1.3 Bending: Product shall withstand, without cracking, bending through the angle indicated below around a diameter equal to 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.

Type of Bend	Angle Deg, min
Free Bend	180
V-Block	135

3.4.2 After Austenite Conditioning, Subzero Transformation, and Precipitation Hardening: Product shall conform to the following requirements after being heated to 1700°F ± 15 (925°C ± 8) held at heat for not less than 1 hr, rapidly cooled to 75°F (25°C) or lower, cooled to -100°F ± 10 (-75°C ± 5) within 1 hr, held at this temperature for not less than 8 hr, warmed in air to room temperature, heated to 950°F ± 10 (510°C ± 5), held at heat for not less than 1 hr, and cooled in air.

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

TABLE I

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. %, min
0.005 to 0.010, excl	220,000	190,000	2
0.010 to 0.020, excl	220,000	190,000	3
0.020 to 0.1875, excl	220,000	190,000	4

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm %, min
0.13 to 0.25, excl	1515	1310	2
0.25 to 0.51, excl	1515	1310	3
0.51 to 4.762, excl	1515	1310	4

3.4.2.1.1 Tensile property requirements for product under 0.005 in. (0.13 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2.2 Hardness:

3.4.2.2.1 Product Over 0.010 In. (0.25 mm) in Nominal Thickness: 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 are met.

3.4.2.2.2 Product 0.010 In. (0.25 mm) and Under in Nominal Thickness: As agreed upon by purchaser and vendor.

3.4.2.3 Fracture Toughness: When specified, shall be determined by a suitable method. The method of testing and standards for acceptance shall be as agreed upon by purchaser and vendor. ASTM E338 is a suggested method of test.

3.5 Quality:

3.5.1 Steel shall be vacuum induction melted.

3.5.2 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 Ø 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 any confirmatory testing deemed 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 Ø 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.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment 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 5603C, size, and quantity from each heat.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 5603C, 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 either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet and strip shall be marked on one face, in the respective location indicated below, with AMS 5603C, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be 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.