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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5604C

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Superseding AMS 5604B

STEEL SHEET, STRIP, AND PLATE, CORROSION RESISTANT
16.5Cr - 4.0Ni - 4.0Cu - 0.30(Cb +Ta)
Solution Heat Treated, Precipitation Hardenable

UNS S17400

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 up to 600°F (316°C) and where such parts may require welding during fabrication. Certain processing procedures and service conditions may cause these products to become 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 and Aerospace Recommended Practices 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
MAM 2242 - Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
AMS 2248 - Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2315 - Determination of Free Ferrite Content
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

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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 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, Ø determined by wet chemical methods in accordance with ASTM E353, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	--	0.07
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	15.00	17.50
Nickel	3.00	5.00
Columbium + Tantalum	5xC	0.45
Copper	3.00	5.00
Molybdenum	--	0.50

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 and Strip: Cold rolled, solution heat treated, and, unless solution Ø heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish (See 8.2).

3.2.2 Plate: Hot rolled, solution heat treated, and descaled.

3.3 Solution Heat Treatment: The product shall be solution heat treated by heating to 1900°F ± 25 (1038°C ± 14), holding at heat for a time Ø commensurate with the thickness and the heating equipment and procedure used, and cooling to below 90°F (32°C).

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:

3.4.1.1.1 Nominal Thickness 0.015 to 0.1875 Inch (0.38 to 4.76 mm), Excl:

Tensile Strength, maximum	185,000 psi (1276 MPa)
Yield Strength at 0.2% Offset, maximum	160,000 psi (1103 MPa)
Elongation in 2 Inches (50.8 mm), minimum	3%

3.4.1.1.2 Nominal Thickness Under 0.015 Inch (0.38 mm) or 0.1875 Inch (4.76 mm) and Over: As agreed upon by purchaser and vendor.

3.4.1.2 Hardness: Shall be not higher than 38 HRC, or equivalent.

3.4.1.3 Microstructure: The product shall contain not more than 5% ferrite, determined in accordance with AMS 2315.

3.4.1.4 Bending: Product 0.109 inch (2.77 mm) and under in nominal thickness shall withstand, without cracking, bending through an angle of 180 degrees around a diameter equal to 18 times the nominal thickness of the product with axis of bend parallel to the direction of rolling. Bending requirements for product over 0.109 inch (2.77 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2 After Precipitation Heat Treatment: The solution heat treated product Ø 4.0 inches (102 mm) and under in nominal thickness shall have the tensile properties shown in Table II and hardness shown in Table III after being precipitation heat treated to a particular condition in accordance with the corresponding temperature and times shown in Table I and cooled as required. Tensile and hardness tests shall be made in only the H900 condition unless purchaser specifies another heat treated condition; solution heat treated product over 4.0 inches (102 mm) in nominal thickness, precipitation heat treated to a particular condition, shall have tensile properties and hardness as agreed upon by purchaer and vendor.

TABLE I

Condition	Temperature	Time
H900	900°F ± 10(482°C ± 6)	60 minutes + 5
H925	925°F ± 10(496°C ± 6)	4 hours + 0.25
H1025	1025°F ± 10(552°C ± 6)	4 hours ± 0.25
H1075	1075°F ± 10(579°C ± 6)	4 hours ± 0.25
H1100	1100°F ± 10(593°C ± 6)	4 hours ± 0.25
H1150	1150°F ± 10(621°C ± 6)	4 hours ± 0.25

3.4.2.1 Tensile Properties:

TABLE II

Condition	Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, minimum	Elongation in 2 Inches or 4D %, minimum	Reduction of Area %, min
H900	Up to 0.1875, excl	190,000	170,000	5	--
	0.1875 to 0.625, incl	190,000	170,000	8	30
	Over 0.625 to 4.000, incl	190,000	170,000	10	35
H925	Up to 0.1875, excl	170,000	155,000	5	--
	0.1875 to 0.625, incl	170,000	155,000	8	30
	Over 0.625 to 4.000, incl	170,000	155,000	10	35
H1025	Up to 0.1875, excl	155,000	145,000	5	--
	0.1875 to 0.625, incl	155,000	145,000	8	35
	Over 0.625 to 4.000, incl	155,000	145,000	12	40
H1075	Up to 0.1875, excl	145,000	125,000	5	--
	0.1875 to 0.625, incl	145,000	125,000	9	35
	Over 0.625 to 4.000, incl	145,000	125,000	13	45
H1100	Up to 0.1875, excl	140,000	115,000	5	--
	0.1875 to 0.625, incl	140,000	115,000	10	35
	Over 0.625 to 4.000, incl	140,000	115,000	14	45
H1150	Up to 0.1875, excl	135,000	105,000	8	--
	0.1875 to 0.625, incl	135,000	105,000	10	40
	Over 0.625 to 4.000, incl	135,000	105,000	16	50

TABLE II (SI)

Condition	Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, minimum	Elongation in 50.8 mm or 4D %, min	Reduction of Area %, min
H900	Up to 4.76, excl	1310	1172	5	--
	4.76 to 15.88, incl	1310	1172	8	30
	Over 15.88 to 101.60, incl	1310	1172	10	35
H925	Up to 4.76, excl	1172	1069	5	--
	4.76 to 15.88, incl	1172	1069	8	30
	Over 15.88 to 101.60, incl	1172	1069	10	35
H1025	Up to 4.76, excl	1069	1000	5	--
	4.76 to 15.88, incl	1069	1000	8	35
	Over 15.88 to 101.60, incl	1069	1000	12	40
H1075	Up to 4.76, excl	1000	862	5	--
	4.76 to 15.88, incl	1000	862	9	35
	Over 15.88 to 101.60, incl	1000	862	13	45
H1100	Up to 4.76, excl	965	793	5	--
	4.76 to 15.88, incl	965	793	10	35
	Over 15.88 to 101.60, incl	965	793	14	45
H1150	Up to 4.76, excl	931	724	8	--
	4.76 to 15.88, incl	931	724	10	40
	Over 15.88 to 102, incl	931	724	16	50

3.4.2.2 Ø Hardness: Shall be within the range shown in Table III, or equivalent, for the corresponding precipitation heat treatment condition but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.2.1 are met.

TABLE III

Condition	Hardness HB	Hardness HRC
H900	375 - 444	40 - 47
H925	352 - 415	38 - 45
H1025	331 - 388	35 - 42
H1075	311 - 363	33 - 39
H1100	302 - 352	32 - 38
H1150	269 - 341	28 - 37

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

3.6 Tolerances: Shall conform to all applicable requirements of AMS 2242 or MAM 2242; flatness tolerance for sheet shall be as specified for cold worked austenitic sheet in half-hard temper.

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 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 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 of each lot to determine conformance to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 5604C, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 5604C, contractor or other direct supplier of product, part number, and quantity. When product for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of product to determine conformance to the requirements of this specification and shall include in the report either a statement that the product 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, strip, and plate shall be marked on one face in the respective location indicated below, with AMS 5604C, heat number, manufacturer's identification, and nominal thickness. The characters shall be 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.

5.1.1 Flat Strip 6 Inches (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 feet (914 mm).