

AEROSPACE
MATERIAL
SPECIFICATION

AMS 5541C
Superseding AMS 5541B

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ALLOY SHEET AND STRIP, CORROSION AND HEAT RESISTANT UNS N07722
73Ni - 15.5Cr - 2.4Ti - 0.70Al - 7.0Fe

1. SCOPE:

- 1.1 Form: This specification covers a corrosion and heat resistant nickel alloy in the form of sheet and strip.
- 1.2 Application: Primarily for parts requiring high strength up to 1500°F (815°C) and oxidation resistance up to 1800°F (980°C). Parts may be formed and then heat treated to improve strength at elevated temperatures.

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) 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 2262 - Tolerances, Nickel, Nickel-Base, and Cobalt-Base Alloy Sheet, Strip, and Plate
- AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt 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

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

- ASTM E8 - Tension Testing of Metallic Materials
- ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
- ASTM E112 - Estimating the Average Grain Size of Metals
- ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials
- ASTM E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt 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 E354, 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	--	0.08
Manganese	--	1.00
Silicon	--	0.70
Sulfur	--	0.01
Chromium	14.00	- 17.00
Nickel + Cobalt	70.00	- --
Titanium	2.00	- 2.75
Aluminum	0.40	- 1.00
Iron	5.00	- 9.00
Cobalt (3.1.1)	--	1.00
Copper	--	0.50

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

3.2 Condition: Cold rolled, annealed, and descaled unless annealing is performed in an atmosphere yielding a bright finish, having a surface appearance comparable to a commercial corrosion resistant steel No. 2D Finish; standards for acceptance shall be as agreed upon by purchaser and vendor.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 As Annealed:

3.3.1.1 Tensile Properties: Shall be as specified in Table I, determined in accordance with ASTM E8.

TABLE I

Nominal Thickness Inch	Tensile Strength psi, max	Elongation in 2 in. or 4D %, min
0.010 to 0.024, incl	130,000	30
Over 0.024 to 0.250, incl	125,000	40

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, max	Elongation in 50 mm or 4D %, min
0.25 to 0.60, incl	895	30
Over 0.60 to 6.25, incl	860	40

3.3.1.1.1 Tensile property requirements for product up to 0.010 in.
 ∅ (0.25 mm), excl, in nominal thickness shall be as agreed upon by purchaser and vendor.

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3.3.1.2 Bending: The product shall withstand, without cracking, bending in accordance with ASTM E290 through an angle of 180 deg 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.

Nominal Thickness		Bend Factor
Inch	(Millimetres)	
Up to 0.050, incl	(Up to 1.25, incl)	1
Over 0.050 to 0.250, incl	(Over 1.25 to 6.25, incl)	2

3.3.1.3 Grain Size: Product 0.010 in. (0.25 mm) and over in nominal thickness shall have an average grain size not over 0.0060 in. (0.150 mm) in diameter (ASTM Grain Size No. 2.5), determined in accordance with ASTM E112.

3.3.1.3.1 Grain size requirements for product up to 0.010 in. (0.25 mm), \emptyset excl, in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating to $1300^{\circ}\text{F} \pm 25$ ($705^{\circ}\text{C} \pm 15$), holding at heat for not less than 16 hr, and cooling in air:

3.3.2.1 Tensile Properties: Shall be as specified in Table II, determined in accordance with ASTM E8.

TABLE II

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
0.010 to 0.024, incl	140,000	90,000	15
Over 0.024 to 0.250, incl	140,000	90,000	20

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
0.25 to 0.60, incl	965	621	15
Over 0.60 to 6.25, incl	965	621	20

- 3.3.2.1.1 Tensile property requirements for product up to 0.010 in.
Ø (0.25 mm), excl, in nominal thickness shall be as agreed upon by purchaser and vendor.
- 3.3.2.2 Hardness: Should be not lower than 23 HRC or equivalent, determined in accordance with ASTM E18, but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.3.2.1 are met.
- 3.4 Quality: The product, as received by purchaser, shall be uniform in
Ø quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.
- 3.5 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2262.
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
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 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 5541C, size, and quantity from each heat.