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

AEROSPACE MATERIAL SPECIFICATION

AMS 5542J
Superseding AMS 5542H
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UNS N07750

ALLOY SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
72Ni - 15.5Cr - 0.95(Cb+Ta) - 2.5Ti - 0.70Al - 7.0Fe

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant nickel alloy in the form of sheet, strip, and plate.

1.2 Application: Primarily for parts requiring high strength up to 1500° F (815° C) and oxidation resistance up to 1800° F (980° C), and for bellows and flat springs requiring optimum resistance to relaxation up to 1000° F (540° C) with moderate or relatively low stresses. 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 Society of Automotive Engineers, Inc., 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

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

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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	--	0.50
Sulfur	--	0.01
Chromium	14.00	17.00
Columbium + Tantalum	0.70	1.20
Titanium	2.25	2.75
Aluminum	0.40	1.00
Iron	5.00	9.00
Cobalt (3.1.1)	--	1.00
Copper	--	0.50
Nickel + Cobalt	70.00	--

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: The product shall be supplied in the following condition:

3.2.1 Sheet and Strip: 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.

3.2.2 Plate: Hot rolled and annealed; when so ordered, plate shall be descaled.

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 Tables I and II, determined in accordance with ASTM E8:

3.3.1.1.1 Strip:

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TABLE I

Nominal Thickness Inch	Tensile Strength psi, max	Elongation in 2 in. or 4D %, min
Up to 0.010, excl	140,000	--
0.010 to 0.025, excl	130,000	20
0.025 and over	As agreed upon	As agreed upon

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, max	Elongation in 50 mm or 4D %, min
Up to 0.25, excl	965	--
0.25 to 0.64, excl	896	20
0.64 and over	As agreed upon	As agreed upon

3.3.1.1.2 Sheet:

TABLE II

Nominal Thickness Inch	Tensile Strength psi, max	Yield Strength at 0.2% Offset psi, max	Elongation in 2 in. or 4D %, min
0.010 to 0.024, incl	140,000	--	30
Over 0.024 to 0.125, incl	130,000	60,000	40
Over 0.125 to 0.250, incl	130,000	65,000	40

TABLE II (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, max	Yield Strength at 0.2% Offset MPa, max	Elongation in 50 mm or 4D %, min
0.25 to 0.61, incl	965	--	30
Over 0.61 to 3.18, incl	896	414	40
Over 3.18 to 6.35, incl	896	448	40

3.3.1.1.3 Plate: As agreed upon by purchaser and vendor.

3.3.1.2 Bending: Product 0.250 in. (6.35 mm) and under in nominal thickness 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 1.27, incl)	1
Over 0.050 to 0.250, incl	(Over 1.27 to 6.35, incl)	2

3.3.1.2.1 Ø Bending requirements for plate over 0.250 in. (6.35 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.1.3 Grain Size: Sheet and strip 0.010 in. (0.25 mm) and over in nominal thickness shall have an average grain size not over 0.0060 in. (0.152 mm) in diameter (ASTM Grain Size No. 2.5), determined in accordance with ASTM E112.

3.3.1.3.1 Ø Grain size requirements for sheet and strip up to 0.010 in. (0.25 mm), excl, in nominal thickness and for plate shall be as agreed upon by purchaser and vendor.

3.3.2 After Precipitation Heat Treatment: The product shall conform to the following requirements after being precipitation heat treated by heating to 1300° F ± 25 (705° C ± 15), holding at heat for 20 hr ± 1, and cooling in air:

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

TABLE III

Product	Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Strip	Up to 0.010, excl	150,000	--	--
	0.010 to 0.025, excl	155,000	--	15
	0.025 and over	155,000	--	15
Sheet	0.010 to 0.250, incl	165,000	105,000	20
Plate	0.187 to 4.000, incl	155,000	100,000	20

TABLE III (SI)

Product	Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D %, min
Strip	Up to 0.25, excl	1034	--	--
	0.25 to 0.64, excl	1069	--	15
	0.64 and over	1069	--	15
Sheet	0.25 to 6.35, incl	1138	724	20
Plate	4.75 to 101.60, incl	1069	690	20

3.3.2.1.1 Elongation requirements do not apply to strip under 0.020 in. (0.51 mm) in nominal thickness.

3.3.2.1.2 Tensile properties for sheet up to 0.010 in. (0.25 mm), excl, and plate over 4.000 in. (101.60 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2.2 Hardness: Strip 0.005 in. (0.13 mm) and over in nominal thickness and plate should have hardness not lower than 30 HRC or equivalent and sheet should have hardness not lower than 32 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 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 Responsiblity 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.

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