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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 5541E

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Superseding AMS 5541D

Submitted for recognition as an American National Standard

NICKEL ALLOY, CORROSION AND HEAT RESISTANT, SHEET AND STRIP
73Ni - 15.5Cr - 2.4Ti - 0.7Al - 7.0Fe
Annealed

UNS N07722

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:

These products have been used typically for parts requiring high strength up to 1500 °F (816 °C) and oxidation resistance up to 1800 °F (982 °C), but usage is not limited to such applications. 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 SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2262 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate

MAM 2262 Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate

AMS 2269 Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys

AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

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2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 8 Tension Testing of Metallic Materials
 ASTM E 8M Tension Testing of Metallic Materials (Metric)
 ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
 ASTM E 290 Semi-Guided Bend Test for Ductility of Metallic Materials
 ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:**3.1 Composition:**
(R)

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	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, unless annealing is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to the following commercial corrosion resistant steel finishes as applicable (See 8.2):

3.2.1 Sheet: No. 2D finish.

3.2.2 Strip: No 1 strip finish.

3.3 Heat Treatment:

Product shall be annealed by heating to a temperature within the range 1750 to 1850 °F (954 to 1010 °C), holding at the selected temperature within ± 25 °F (± 14 °C) for a time commensurate with section thickness, and cooling rapidly.

3.4 Properties:

The product shall conform to the following requirements:

3.4.1 As Annealed:

3.4.1.1 Tensile Properties: Shall be as specified in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 2A - Tensile Properties, Inch/Pound Units

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

TABLE 2B - Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa, max	Elongation in 50.8 mm or 4D %, min
0.25 to 0.61, incl	896	30
Over 0.61 to 6.35, incl	862	40

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3.4.1.1.1 Tensile property requirements for product under 0.010 inch (0.25 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.1.2 Bending: The product shall withstand, without cracking, bending in accordance with ASTM E 290 through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 3 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 3 - Bending Parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
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

3.4.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating to $1300^{\circ}\text{F} \pm 25$ ($704^{\circ}\text{C} \pm 14$), holding at heat for not less than 16 hours, and cooling in air:

3.4.2.1 Tensile Properties: Shall be as specified in Table 4, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 4A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.010 to 0.024, incl	140	90.0	15
Over 0.024 to 0.250, incl	140	90.0	20

TABLE 4B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
0.25 to 0.61, incl	965	621	15
Over 0.61 to 6.35, incl	965	621	20