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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5542L

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Superseding AMS 5542K

Nickel Alloy, Corrosion and Heat Resistant, Sheet, Strip, and Plate
72Ni - 15.5Cr - 0.95Cb - 2.5Ti - 0.70Al - 7.0Fe
Annealed

UNS N07750

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:

These products have been used typically for parts requiring high strength up to approximately 1500 °F (816 °C) and oxidation resistance up to approximately 1800 °F (980 °C), and for bellows and flat springs requiring optimum resistance to relaxation up to approximately 1000 °F (538 °C) with moderate or relatively low stresses, but usage is not limited to such applications.

1.2.1 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

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

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 112 Determining the Average Grain Size
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 DODSSP, Subscription Services 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:

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	--	0.50
Sulfur	--	0.01
Chromium	14.00	17.00
Columbium	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
Tantalum (3.1.1)	--	0.05
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, unless annealing is performed in an atmosphere yielding a bright finish, descaled, if required, having a surface appearance comparable to the following commercial corrosion-resistant steel finishes as applicable (see 8.2):

3.2.1.1 Sheet: No. 2D finish

3.2.1.2 Strip: No. 1 strip finish

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 3.3.1.1.1 and 3.3.1.1.2, determined in accordance with ASTM E 8 or ASTM E 8M.

3.3.1.1.1 Strip: Shall be as shown in Table 2.

TABLE 2A - Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi, max	Elongation in 2 Inches %, min
Up to 0.010, excl	140	--
0.010 to 0.025, excl	130	20

TABLE 2B - Tensile Properties, SI Units

Nominal Thickness Millimeter	Tensile Strength MPa, max	Elongation in 50.8 mm %, min
Up to 0.25, excl	965	--
0.25 to 0.64, excl	896	20

3.3.1.1.2 Sheet: Shall be as shown in Table 3.

TABLE 3A - Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi, max	Yield Strength at 0.2% Offset ksi, max	Elongation in 2 Inches %, min
0.010 to 0.024, incl	140	--	30
Over 0.024 to 0.125, incl	130	60.0	40
Over 0.125 to 0.1874, incl	130	65.0	40

TABLE 3B - Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa, max	Yield Strength at 0.2% Offset MPa, max	Elongation in 50.8 mm %, min
0.25 to 0.61, incl	965	--	30
Over 0.61 to 3.18, incl	896	414	40
Over 3.18 to 4.76, incl	896	448	40

3.3.1.2 Bending: Product 0.1874 inch (4.76 mm) and under in nominal thickness 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 4 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 4 - 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 0.1874, incl	Over 1.27 to 4.76, incl	2

3.3.1.3 Average Grain Size: Sheet and strip 0.010 to 0.1874 inch (0.25 to 4.76 mm) in nominal thickness shall have an average grain size not over 0.0060 inch (0.152 mm) in diameter (ASTM Grain Size No. 2.5), determined in accordance with ASTM E 112.

3.3.1.3.1 Grain size requirements for sheet and strip under 0.010 inch (0.25 mm) 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 (704 °C ± 14), holding at heat for 20 hours ± 1, and cooling in air:

3.3.2.1 Tensile Properties: Shall be as specified in Table 5, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 5A - Minimum Tensile Properties, Inch/Pound Units

Product	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Strip	Up to 0.010, excl	150	--	--
	0.010 to 0.025, excl	155	--	15
	0.025 to 0.1874, incl	155	--	15
Sheet	0.010 to 0.1874, incl	165	105	20
Plate	0.1875 to 4.000, incl	155	100	20

TABLE 5B - Minimum Tensile Properties, SI Units

Product	Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Strip	Up to 0.25, excl	1034	--	--
	0.25 to 0.64, excl	1069	--	15
	0.64 to 4.760, incl	1069	--	15
Sheet	0.25 to 4.760, incl	1138	724	20
Plate	4.762 to 101.60, incl	1069	689	20

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

3.3.2.2 Hardness: Strip 0.005 to 0.1874 inch (0.13 to 4.760 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 (see 8.3), determined in accordance with ASTM E 18.

3.4 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.

3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2262 or MAM 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. 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 for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2371.

4.4 Reports:

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. This report shall include the purchase order number, heat and/or lot number, AMS 5542L, size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2371.