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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5582C

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Superseding AMS 5582B

Submitted for recognition as an American National Standard

NICKEL ALLOY, CORROSION AND HEAT RESISTANT, SEAMLESS TUBING
72Ni - 15.5Cr - 0.95 (Cb+Ta) - 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 seamless tubing.

1.2 Application:

This tubing has been used typically for fluid lines requiring high strength up to 1300 °F (704 °C) and oxidation resistance up to 1800 °F (980 °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 2263 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Tubing
MAM 2263 Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Tubing
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

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 112 Determining the Average Grain Size
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	--	0.50
Sulfur	--	0.010
Chromium	14.00	17.00
Nickel + Cobalt	70.00	--
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

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:

(R)

Bright annealed or annealed and descaled. Cooling from the annealing temperature shall be at a rate equivalent to an air cool or faster.

3.3 Fabrication:

(R)

Tubing shall be produced by a seamless process.

3.4 Properties:

Tubing 0.125 inch (3.18 mm) and over in nominal OD and 0.015 inch (0.38 mm) and over in nominal wall thickness shall conform to the following requirements. Properties of tubing under 0.125 inch (3.18 mm) in nominal OD or under 0.015 inch (0.38 mm) in nominal wall thickness shall be as agreed upon by purchaser and vendor.

3.4.1 As Annealed:

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

TABLE 2 - Tensile Properties

Property	Value
Tensile Strength, maximum	140 ksi (965 MPa)
Yield Strength at 0.2% Offset, maximum	80.0 ksi (552 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, minimum	
Strip Specimen	30%
Full Tube	35%

3.4.1.2 Grain Size: Shall average not over 0.0060 inch (0.152 mm) in diameter (Grain Size No. 2.5), determined by comparison of a polished and etched specimen with the chart in ASTM E 112.

3.4.1.3 Flarability: Specimens as in 4.3.1 from tubing 0.188 to 2.000 inches (4.78 to 50.80 mm), inclusive, in nominal OD shall withstand flaring at room temperature, without formation of cracks or other visible defects, by being forced axially with steady pressure over a hardened and polished tapered steel pin having a 74-degree included angle to produce a flare having a permanent expanded OD not less than 1.20 times the original nominal OD.

3.4.1.3.1 Flarability requirements for tubing over 2.000 inches (50.80 mm) or under 0.188 inch (4.78 mm) in nominal OD shall be as agreed upon by purchaser and vendor.

3.4.1.4 Pressure Test: Tubing shall show no bulges, leaks, pinholes, cracks, or other defects when subjected to an internal hydrostatic pressure (P) sufficient to cause a tensile stress of 20.0 ksi (138 MPa) in the tubing wall. The hydrostatic pressure (P) shall be determined from Equation 1:

$$P = S \frac{D^2 - d^2}{D^2 + d^2} \qquad \text{(Eq. 1)}$$

where, P = Test pressure in ksi (MPa)
S = 20.0 ksi (138 MPa)
D = Nominal OD in inches (mm)
d = Nominal ID in inches (mm)

3.4.2 After Precipitation Heat Treatment: Tubing shall have the following properties 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:

3.4.2.1 Tensile Properties: Shall be as shown in Table 3, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 3 - Minimum Tensile Properties

Property	Value
Tensile Strength	155 ksi (1069 MPa)
Yield Strength at 0.2% Offset	100 ksi (689 MPa)
Elongation in 2 Inches (50.8 mm) or 4D	
Strip Specimen	15%
Full Tube	20%

3.5 Quality:

3.5.1 Tubing, as received by purchaser, shall be uniform in quality and condition and shall have a finish conforming to the best practice for high quality aircraft tubing. It shall be smooth, and free from heavy scale or oxide, burrs, seams, tears, cracks, grooves, laminations, slivers, pits, and other imperfections detrimental to usage of the tubing. Surface imperfections, such as handling marks, straightening marks, light mandrel and die marks, shallow pits, and scale pattern, will not be considered injurious if the imperfections are removable within the tolerances specified for wall thickness but removal of such imperfections is not required.

3.5.2 Tubing shall be free from grease or other foreign matter. Metallic flakes or particles shall not be collected on a clean white cloth drawn through the length of the bore of a test sample. Discoloration of the cloth, without the presence of flakes or particles, is acceptable.