

**AEROSPACE
MATERIAL
SPECIFICATION**

Submitted for recognition as an American National Standard

AMS 5579B

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Superseding AMS 5579A

STEEL TUBING, WELDED, CORROSION AND HEAT RESISTANT
19.5Cr - 9.5Ni - 1.4Mo - 1.4W - 0.42(Cb + Ta) - 0.22Ti
Thin Wall

UNS K63198

1. SCOPE:

- 1.1 Form: This specification covers a corrosion and heat resistant steel in the form of welded tubing.
- 1.2 Application: Primarily for high-pressure air ducting requiring both corrosion and heat resistance wherein the wall thickness is approximately 2% of the nominal OD or less.

- 2. APPLICABLE DOCUMENTS:** The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications 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 2248 - Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron 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
- AMS 2635 - Radiographic Inspection

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

ASTM A262 - Detecting Susceptability to Intergranular Attack in Austenitic Stainless Steels

ASTM A370 - Mechanical Testing of Steel Products

ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging and Other Similar Chromium-Nickel-Iron 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 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, $\emptyset$ determined by wet chemical methods in accordance with ASTM E353 or by spectrographic or other analytical methods approved by purchaser:

	min	max
Carbon	0.28 -	0.35
Manganese	0.75 -	1.50
Silicon	0.30 -	0.80
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	18.00 -	21.00
Nickel	8.00 -	11.00
Molybdenum	1.00 -	1.75
Tungsten	1.00 -	1.75
Columbium + Tantalum	0.25 -	0.60
Titanium	0.10 -	0.35
Copper	--	0.50

- 3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2248.

- 3.2 Condition: As welded, descaled, and passivated. Tubing shall have been $\emptyset$ rolled only enough to ensure proper weld bead height and roundness in the weld bead area.

- 3.3 Fabrication: Tubing shall be fabricated from solution heat treated sheet or strip, shall be machine fusion welded by gas-metal-arc process, shall contain not more than one longitudinal weld, and shall contain no circumferential welds. Tube ends shall be cut square and deburred. Tubing, except for the weld bead, shall have a surface appearance comparable to a commercial corrosion-resistant steel No. 2D sheet finish.

- 3.4 Properties: Tubing shall conform to the following requirements; tensile and bend testing shall be performed in accordance with ASTM A370:



3.4.1 Tensile Properties: Shall be as follows:

Tensile Strength	95,000 - 125,000 psi (655 - 860 MPa)
Yield Strength at 0.2% Offset, min	45,000 psi (310 MPa)
Elongation in 2 in. (50 mm), min	
Strip (See 4.3.1)	30%
Full Section	35%

3.4.2 Bending: A specimen as in 4.3.2 shall withstand, without evidence of cracks or other imperfections when examined at 10X magnification, bending at room temperature 180 deg around a diameter equal to two times the nominal wall thickness of the tubing with axis of bend perpendicular to axis of weld and with outside of tube on inside of bend.

3.4.3 Weld Crack Susceptibility: A specimen as in 4.3.3 shall withstand, without evidence of cracks occurring in, or adjacent to, the weld bead when examined at 10X magnification, being pulled parallel to the direction of the weld bead until rupture occurs.

3.4.4 Embrittlement: Specimens of tubing taken to include the weld, after sensitization treatment, shall pass the copper/copper sulfate/sulfuric acid test performed in accordance with ASTM A262, Practice E, without evidence of intercrystalline surface attack. After exposure, specimens shall withstand, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to two times the nominal thickness of the specimen with axis of bend perpendicular to the axis of the tubing.

3.4.5 Pressure Test: After all fabricating and sizing operations, each length of tubing shall withstand for 1 min., without leakage or developing bulges, permanent set, or other imperfections which exceed the allowable tolerances for the finished tubing, a gradually applied internal hydrostatic pressure (P), calculated from the following equation:

$$P = \frac{2St}{D}$$

where, P = Test pressure in psi (MPa)

S = 20,000 psi (140 MPa) tensile stress

t = Nominal wall thickness

D = Nominal OD

3.4.6 Weld Strength: Shall be as follows, determined in accordance with 3.4.6.1 or 3.4.6.2.

3.4.6.1 Hydrostatic Pressure Tests: A specimen as in 4.3.4 shall withstand an internal hydrostatic pressure of 95,000 psi (655 MPa) for not less than 60 sec without rupture. Hydrostatic pressure (P) shall be calculated from the equation of 3.4.5 and shall be applied gradually in 30 - 60 sec at not lower than 60°F (15°C).

3.4.6.2 Tensile Strength: Shall be not lower than 95,000 psi (655 MPa) determined on specimens as in 4.3.5.