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

AEROSPACE MATERIAL SPECIFICATION

AMS5568A
Superseding 5568

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UNS S17700

STEEL TUBING, WELDED, CORROSION AND MODERATE HEAT RESISTANT 17Cr - 7.1Ni - 1.1Al

1. SCOPE:

1.1 Form: This specification covers a precipitation-hardenable, corrosion and moderate heat resistant steel in the form of welded tubing.

1.2 Application: Primarily for parts and assemblies requiring both corrosion resistance and high strength up to 600°F (316°C). Certain design and processing procedures may cause this material to be susceptible to stress-corrosion cracking; ARP 1110 recommends practices to minimize such conditions.

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) and Aerospace Recommended Practices (ARP) 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, Pennsylvania 15096.

2.1.1 Aerospace Material Specifications:

AMS 2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

2.1.2 Aerospace Recommended Practices:

ARP 1110 - Minimizing Stress-Corrosion Cracking in Heat-Treatable Wrought Low-Alloy and Martensitic Corrosion-Resistant Steels

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

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 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

Printed in U.S.A.

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods Ø in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	--	0.09
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	16.00	18.00
Nickel	6.50	7.75
Aluminum	0.75	1.50

Ø3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

Ø3.2 Condition: Solution heat treated and descaled.

3.3 Solution Heat Treatment: Tubing shall be solution heat treated by heating to 1950°F ± 25 (1065.6°C ± 14), Ø holding at heat for a time commensurate with section size and heating equipment and procedure used, and cooling in air or quenching in water.

3.4 Properties: The product shall conform to the following requirements; hardness and tensile testing shall be Ø performed in accordance with ASTM A370:

3.4.1 As Solution Heat Treated:

3.4.1.1 Tensile Properties:

Tensile Strength, max	150,000 psi (1034 MPa)
Yield Strength at 0.2% Offset, max	55,000 psi (379 MPa)
Elongation in 2 in. (50.8 mm), min	20%

3.4.1.2 Hardness: Should be not higher than 92 HRB or equivalent but tubing shall not be rejected on the basis Ø of hardness if the tensile property requirements of 3.4.1.1 are met.

Ø3.4.1.3 Flarability: Shall be as agreed upon by purchaser and vendor.

3.4.1.4 Pressure Test: The tubing shall show no bulges, leaks, or other defects when subjected to an internal hydrostatic pressure, based on nominal dimensions, sufficient to cause a tensile stress of 20,000 psi (138 MPa) in the tubing wall.

3.4.2 After Austenite Conditioning and Precipitation Heat Treated: Tubing shall conform to the requirements of 3.4.2.1 and 3.4.2.2 after being austenite conditioned by heating to 1400°F ± 25 (760°C ± 14), holding Ø at heat for 90 min. ± 5, cooling to 55°F ± 5 (12.8°C ± 2.8) within 1 hr, holding at that temperature for not less than 30 min., and precipitation heat treated by heating to 1050°F ± 10 (565.6°C ± 5.6), holding at heat for 90 min. ± 5, and cooling to room temperature:

3.4.2.1 Tensile Properties:

Tensile Strength, min	180,000 psi (1241 MPa)
Yield Strength at 0.2% Offset, min	150,000 psi (1034 MPa)
Elongation in 2 in. (50.8 mm), min	6%

3.4.2.2 Hardness: Should be not lower than 38 HRC but the tubing shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.2.1 are met.

3.5 Quality:

3.5.1 Tubing shall be uniform in quality and condition and shall have a workmanlike finish conforming to the best practice for high quality material. It shall be smooth, clean, and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits, and other injurious conditions. 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. The removal of surface imperfections is not required.

3.5.2 If beads are present at the welds on the inner surface of the tubing, such beads shall be not thicker than 0.010 in. (0.25 mm), unless otherwise specified. The outer surface of the tubing shall be free from beads.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, tubing will be acceptable in mill lengths of 6 - 20 ft (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.7 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2243.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of tubing shall supply all samples 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 perform such confirmatory testing as he deems necessary to assure that the tubing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), tensile property (3.4.1.1 and 3.4.2.1), pressure test (3.4.1.4), quality (3.5), and tolerance (3.7) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to flarability (3.4.1.3) requirements are classified as qualification or periodic control tests.

4.3 Sampling: Shall be in accordance with AMS 2371 and the following:

4.3.1 Specimens for flarability test may be cut from any portion of a tube or an entire tube may be used as a specimen. The end of the specimen to be flared shall be cut square, with the cut end smooth and free from burrs, but not rounded.

4.4 Reports: