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400 COMMONWEALTH DRIVE. WARRENDALE. PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5568B
Superseding AMS 5568A

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UNS S17700

STEEL TUBING, WELDED, CORROSION AND MODERATE HEAT RESISTANT 17Cr - 7.1Ni - 1.1Al Solution Heat Treated, Precipitation-Hardenable

1. SCOPE:

1.1 Form: This specification covers a 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 (315°C). Certain design and processing procedures may cause this tubing to become 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, PA 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 Steels and Alloys, Wrought Products Except Forgings and Forging Stock

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

2.3.1 Federal Standards:

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

2.3.2 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, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	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

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

3.2 Condition: Solution heat treated and descaled.

3.3 Fabrication: Tubing shall be produced by the welded and drawn process. Any surface finishing operation applied to remove objectionable pits and surface blemishes shall be performed prior to final solution heat treatment. A light polish to improve surface appearance may be employed after solution heat treatment. Passivation treatment shall follow any polishing treatment.

3.4 Solution Heat Treatment: Tubing shall be solution heat treated by heating to 1950°F ± 25 (1065°C ± 15), holding at heat for a time commensurate with section size and heating equipment and procedure used, and cooling in air or quenching in water.

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

3.5.1 As Solution Heat Treated:

3.5.1.1 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 mm), min	20%

3.5.1.2 Hardness: Should be not higher than 92 HRB or equivalent but tubing shall not be rejected on the basis of hardness if the tensile property requirements of 3.5.1.1 are met.

3.5.1.3 Flarability: Specimens as in 4.3.1 shall withstand, without formation of cracks or other visible defects, flaring at room temperature by being forced axially with steady pressure over a hardened and polished tapered steel pin having a 74 deg included angle to produce a flare having a permanent expanded OD as agreed upon by purchaser and vendor.

3.5.1.4 Pressure Test: 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.

3.5.2 After Austenite Conditioning and Precipitation Heat Treating: Tubing shall have the properties shown in 3.5.2.1 and 3.5.2.2 after being austenite conditioned by heating to 1400°F ± 25 (760°C ± 15), holding at heat for 90 min. ± 5, cooling to 55°F ± 5 (13°C ± 3) within 1 hr, holding at that temperature for not less than 30 min., and precipitation heat treated by heating to 1050°F ± 10 (565°C ± 5), holding at heat for 90 min. ± 5, and cooling to room temperature.

3.5.2.1 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 mm), min	6%

3.5.2.2 Hardness: Should be not lower than 38 HRC but the tubing shall not be rejected on the Ø basis of hardness if the tensile property requirements of 3.5.2.1 are met.

3.6 Quality:

3.6.1 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, grooves, laminations, slivers, pits, Ø 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 surface imperfections is not required.

3.6.2 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.

3.6.3 When specified by purchaser, tubing shall be subjected to nondestructive testing. Methods of Ø testing and standards for acceptance shall be as agreed upon by purchaser and vendor.

3.7 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight 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).

3.8 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 for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be re- Ø ported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure 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 requirements for composition (3.1), tensile properties (3.5.1.1 and 3.5.2.1), pressure test (3.5.1.4), quality (3.6), and tolerances (3.8) are classified as acceptance tests and shall be performed on each heat or lot as Ø applicable.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for flarability (3.5.1.3) are classified as periodic tests and shall be performed at a frequency selected by the vendor un- Ø less frequency of testing is specified by purchaser.

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

4.3.1 Specimens for flarability test (3.5.1.3) shall be full tubes or sections cut from tubes. 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:

4.4.1 The vendor of tubing shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and for tensile properties and pressure test of each lot. This report shall include the purchase order number, heat number, AMS 5568B, size, and quantity from each heat.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 5568B, contractor or other direct supplier of tubing, part number, and quantity. When tubing for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of tubing to determine conformance to the requirements of this specification, and shall include in the report a statement that the tubing conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Tubing shall be identified as follows:

5.1.1 Straight Tubes 0.029 In. (0.75 mm) and Over in Wall Thickness and 0.500 In. (12.5 mm) and Over in OD, Minor Axis, or Least Width of Flat Surface: Shall be marked in a row of characters recurring at intervals not greater than 3 ft (900 mm) with AMS 5568B, heat number, manufacturer's identification, and nominal wall thickness. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the tubing or its performance and shall be sufficiently stable to withstand normal handling.

5.1.2 Straight Tubes Under 0.029 In. (0.75 mm) in Wall Thickness or Under 0.500 In. (12.5 mm) in OD, Minor Axis, or Least Width of Flat Surface: Shall be securely bundled and identified by a durable tag marked with the information of 5.1.1 and the nominal OD and attached to each bundle or shall be boxed and the box marked with the same information.

5.1.3 Coiled Tubing: Shall be securely bundled and identified by a durable tag marked with the purchase order number, AMS 5568B, heat number, nominal OD and wall thickness, and manufacturer's identification and attached to each coil or shall be boxed and the box marked with the same information.

5.2 Packaging:

5.2.1 Tubing shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the tubing to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.