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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5568E

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Superseding AMS 5568D

Submitted for recognition as an American National Standard

Steel, Corrosion and Heat Resistant, Welded Tubing
17Cr - 7.1Ni - 1.1Al
Solution Heat Treated, Precipitation-Hardenable

UNS S17700

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant steel in the form of welded tubing.

1.2 Application:

This tubing has been used typically for parts requiring corrosion resistance and high strength up to 600 °F (316 °C) after precipitation heat treatment, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause this tubing to become susceptible to stress-corrosion cracking after precipitation heat treatment; ARP1110 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 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 2243	Tolerances, Corrosion and Heat Resistant Steel Tubing
MAM 2243	Tolerances, Metric, Corrosion and Heat Resistant Steel Tubing
AMS 2248	Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7154 FAX: (724) 776-0243
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2.1 (Continued):

AMS 2632 Ultrasonic Inspection of Thin Materials, 0.5 Inch (13 mm) and Thinner
AMS 2645 Fluorescent Penetrant Inspection
AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

ARP1110 Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 370 Mechanical Testing of Steel Products
ASTM E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys
ASTM E 426 Electromagnetic (Eddy Current) Testing of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar 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 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	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 a welded and drawn process. Any 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.

3.4 Solution Heat Treatment:

Tubing shall be solution heat treated by heating to 1950 °F ± 25 (1066 °C ± 14), holding at heat for a time commensurate with wall thickness 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 A 370.

3.5.1 As Solution Heat Treated:

3.5.1.1 Tensile Properties: Shall be as shown in Table 2.

TABLE 2 - Tensile Properties

Property	Value
Tensile Strength, max	150 ksi (1034 MPa)
Yield Strength at 0.2% Offset, max	55.0 ksi (379 MPa)
Elongation in 2 Inches (50.8 mm), min	20%

3.5.1.2 Hardness: Shall be not higher than 92 HRB, or equivalent (See 8.2).

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-degree included angle to produce a flare having a permanent expanded OD as agreed upon by purchaser and vendor.

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 ± 14), holding at heat for 90 minutes ± 5, cooling to 55 °F ± 5 (13 °C ± 3) within one hour, holding at that temperature for not less than 30 minutes, and precipitation heat treated by heating to 1050 °F ± 10 (566 °C ± 6), holding at heat for 90 minutes ± 5, and cooling to room temperature.

3.5.2.1 Tensile Properties: Shall be as shown in Table 3.

TABLE 3 - Minimum Tensile Properties

Property	Value
Tensile Strength	180 ksi (1241 MPa)
Yield Strength at 0.2% Offset	150 ksi (1034 MPa)
Elongation in 2 Inches (50.8 mm)	6%

3.5.2.2 Hardness: Shall be not lower than 38 HRC, or equivalent (See 8.2).

3.6 Quality:

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.

3.6.1 If weld reinforcement is present at the welds on the inner surface of the tubing, such weld reinforcement shall be not thicker than 0.010 inch (0.25 mm). The outer surface of the tubing shall be free from weld reinforcement.

3.6.2 When specified by purchaser, tubing shall be subjected to fluorescent penetrant inspection in accordance with AMS 2645, to ultrasonic inspection in accordance with AMS 2632, to electromagnetic (eddy-current) testing in accordance with ASTM E 426, or to any combination thereof. Tubing shall meet the requirements of 3.6 and other acceptance criteria established by the cognizant engineering organization.

3.7 Tolerances:

Shall conform to all applicable requirements of AMS 2243 or MAM 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. 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: Composition (3.1), tensile properties (3.5.1.1 and 3.5.2.1), quality (3.6), and tolerances (3.7) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Hardness (3.5.1.2 and 3.5.2.2) and flarability (3.5.1.3) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

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 a tube. 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:

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