SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5568 REV. G

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Superseding AMS5568F

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

(Composition similar to UNS S17700)

RATIONALE

AMS5568G results from a Five Year Review and update of this specification.

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2243 Tolerances, Corrosion and Heat-Resistant Steel Tubing

AMS2248 Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

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http://www.sae.org/technical/standards/AMS5568G

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2632 Inspection, Ultrasonic, of Thin Materials, 0.50 Inch (12.7 mm) and Under in Cross-Sectional Thickness

AMS2807 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 International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

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) Examination of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys

ASTM E 1417 Liquid Penetrant Testing

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

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3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.2 Condition

Solution heat treated and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, pickled as required or passivated. Tubing shall have been cold worked sufficiently to ensure proper weld reinforcement height and roundness in the weld reinforcement area.

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 external surface appearance may be employed after solution heat treatment and, if performed, the product shall be subsequently passivated.

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 ksi (379 MPa)
Elongation in 2 Inches (50.8 mm), min	20%

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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 (See 8.5).

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 1 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 grease, oil and other foreign matter, 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 ASTM E 1417, to ultrasonic inspection in accordance with AMS2632, to electromagnetic (eddy-current) testing in accordance with ASTM E 426, or to any combination thereof. Standards for such inspections shall be as agreed upon between purchaser and vendor (See 8.5).

3.7 Tolerances

Shall conform to all applicable requirements of AMS2243.

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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to specified requirements.

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 AMS2371 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.

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