

 <p><b>SAE</b> The Engineering Society For Advancing Mobility Land Sea Air and Space® <b>INTERNATIONAL</b></p> <p>400 Commonwealth Drive, Warrendale, PA 15096-0001</p> <p style="text-align: center;"><b>AEROSPACE MATERIAL SPECIFICATION</b></p> <p style="text-align: center;">Submitted for recognition as an American National Standard</p>	<p><b>SAE</b></p>	<p><b>AMS 5554C</b></p>
<p>Issued SEP 1957 Revised JUL 1994 Superseding AMS 5554B</p>		
<p>STEEL, CORROSION AND HEAT RESISTANT, SEAMLESS TUBING 16.5Cr - 4.5Ni - 2.9Mo - 0.10N Annealed</p> <p style="text-align: right;">UNS S35000</p>		
<p>1. SCOPE:</p> <p>1.1 Form:</p> <p>This specification covers a corrosion and heat resistant steel in the form of thin-wall seamless tubing.</p> <p>1.2 Application:</p> <p>This tubing has been used typically for parts, such as fluid lines, requiring high strength and oxidation resistance up to 800 °F (427 °C), but usage is not limited to such applications.</p> <p>2. APPLICABLE DOCUMENTS:</p> <p>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.</p>		

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

AMS 5554C

SAE

AMS 5554C

## 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
- 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

## 2.2 ASTM Publications:

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

- ASTM E 8 Tension Testing of Metallic Materials
- ASTM E 8M Tension Testing of Metallic materials (Metric)
- 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 Steels 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.

AMS 5554C

SAE

AMS 5554C

TABLE 1 - Composition

Element	min	max
Carbon	0.08	0.12
Manganese	0.50	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	16.00	17.00
Nickel	4.00	5.00
Molybdenum	2.50	3.25
Nitrogen	0.07	0.13

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

3.2 Condition:

Cold drawn, annealed, and descaled.

3.3 Fabrication:

Tubing shall be produced by a seamless process. Any surface finishing operation applied to remove objectionable pits and surface blemishes shall be performed prior to final anneal. A light polish to improve surface appearance may be employed after anneal. Passivation treatment shall follow any polishing operation.

3.4 Heat Treatment:

(R)

Tubing shall be annealed by heating to 1850 to 1975 °F (1010 to 1079 °C), holding at the selected temperature within  $\pm 25$  °F ( $\pm 14$  °C) for a time commensurate with cross-sectional wall thickness, and cooling as rapidly as possible to room temperature.

3.5 Properties:

Tubing shall conform to the following requirements:

3.5.1 As Received:

3.5.1.1 Flareability: Specimens as in 4.3.1 from tubing 0.500 to 2.000 inches (12.70 to 50.80 mm), inclusive, in nominal OD 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 not less than 1.20 times the original nominal OD.

AMS 5554C

SAE

AMS 5554C

3.5.1.1.1 Flarability requirements for tubing under 0.500 inch (12.70 mm) or over 2.000 inches (50.80 mm) in nominal OD shall be as agreed upon by purchaser and vendor.

3.5.2 After Reannealing, Precipitation Hardening, and Tempering: Tubing shall have the following properties after being reannealed by heating to  $1710\text{ }^{\circ}\text{F} \pm 25$  ( $932\text{ }^{\circ}\text{C} \pm 14$ ), holding at heat for not less than 90 minutes per inch (25 mm) of wall thickness, and cooling in air to room temperature, heating to  $1375\text{ }^{\circ}\text{F} \pm 25$  ( $746\text{ }^{\circ}\text{C} \pm 14$ ), holding at heat for not less than 1 hour, cooling in air to room temperature, heating to  $850\text{ }^{\circ}\text{F} \pm 25$  ( $454\text{ }^{\circ}\text{C} \pm 14$ ), holding at heat for not less than 3 hours, and cooling in air to room temperature:

3.5.2.1 Tensile Properties: Shall be as shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	165 ksi (1138 MPa)
Yield Strength at 0.2% Offset	130 ksi ( 896 MPa)
Elongation in 2 inches (50.8 mm)	10%

### 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, 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 When specified by purchaser, tubing shall be subjected to fluorescent (R) 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. Standards for acceptance shall be as established by purchaser.

### 3.7 Tolerances:

Shall conform to all applicable requirements of AMS 2243 or MAM 2243.