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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5554B

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Superseding AMS 5554A

STEEL TUBING, SEAMLESS, CORROSION AND MODERATE HEAT RESISTANT
16.5Cr - 4.5Ni - 2.9Mo - 0.10N
Annealed

UNS S35000

1. SCOPE:

1.1 Form: This specification covers a corrosion and moderate heat resistant steel in the form of thin-wall seamless tubing.

1.2 Application: Primarily for parts such as fluid lines, requiring high strength and oxidation resistance up to 800°F (427°C).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

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 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
AMS 2632 - Ultrasonic Inspection of Thin Materials, 0.5 Inch (13 mm) and Thinner
AMS 2645 - Fluorescent Penetrant Inspection
AMS 2750 - Pyrometry

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

ASTM E8 - Tension Testing of Metallic Materials
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 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, Ø determined by wet chemical methods in accordance with ASTM E353, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	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: Tubing shall be annealed by heating to 1850° - 1975°F Ø (1010° - 1079°C), holding at the selected temperature within ± 25°F (±14°C) for not less than 90 minutes per inch (25 mm) of wall thickness, and cooling as rapidly as possible to room temperature. Pyrometry shall be in accordance with AMS 2750.

3.5 Properties: Tubing shall conform to the following requirements:

3.5.1 As Received:

3.5.1.1 Flarability: Specimens as in 4.3.1 from tubing 0.500 - 2.000 inch (12.70 - 50.80 mm), incl, 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.

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°F + 25 (932°C + 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°F + 25 (746°C + 14), holding at heat for not less than 1 hour, cooling in air to room temperature, heating to 850°F + 25 (454°C + 14), holding at heat for not less than 3 hours, and cooling in air to room temperature:

3.5.2.1 Tensile Properties:

Tensile Strength, minimum	165,000 psi (1138 MPa)
Yield Strength at 0.2% Offset, minimum	130,000 psi (896 MPa)
Elongation in 2 Inches (50.8 mm), minimum	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 penetrant inspection in accordance with AMS 2645, to ultrasonic inspection in accordance with AMS 2632, or to both. 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 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

3.8 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. Results of such tests shall be reported 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), nondestructive inspection when specified (3.6.1), and tolerances (3.8) are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for flarability (3.5.1.1) and tensile properties (3.5.2.1) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless 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 (3.5.1.1) 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:

4.4.1 The vendor of tubing shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and, when performed, results of tests to determine conformance to the periodic test requirements. This report shall include the purchase order number, heat number, AMS 5554B, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 5554B, 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 either a statement that the tubing conforms or copies of laboratory reports showing the results of tests to determine conformance.

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