



AEROSPACE MATERIAL SPECIFICATION

AMS5563™**REV. D**

Issued 1985-07
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Revised 2021-10

Superseding AMS5563C

Steel, Corrosion Resistant, Seamless or Welded Tubing
19Cr - 9.5Ni (SAE 30304)
Cold Drawn, 1/4 Hard Temper
(Composition similar to UNS S30400)

RATIONALE

AMS5563D prohibits unauthorized exceptions (3.7, 4.4.5, 5.2.1, 8.5), updates composition testing (3.1), updates condition and fabrication requirements (3.2, 3.3) updates tensile testing (3.4.1.1), updates inspection (3.5), adds NDT acceptance testing (4.2.1.1, 4.4.3, 8.6), clarifies tolerances and identification (3.6, 5.2), adds country of origin (4.4), adds a definition (8.2.1), allows prior revisions (8.4), and is the result of a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion-resistant steel in the form of seamless and drawn or welded and drawn tubing.

1.2 Application

This tubing has been used typically in the fabrication of parts requiring good corrosion resistance, but usage is not limited to such applications. This tubing is not suitable for use in applications requiring flaring or sharp bends. Welding or other exposure over 800 °F (427 °C) during fabrication may impair corrosion resistance.

1.3 Classification

Tubing covered by this specification is classified as follows:

Type 1 - Seamless and drawn

Type 2 - Welded and drawn

1.3.1 Unless a specific type is ordered, either Type 1 or Type 2 may be supplied.

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.

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<https://www.sae.org/standards/content/AMS5563D/>

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970, 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
AMS2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS2634	Ultrasonic Inspection, Thin Wall Metal Tubing
AMS2700	Passivation of Corrosion Resistant Steels
AMS2807	Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications

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 A370	Mechanical Testing of Steel Products
ASTM A751	Chemical Analysis of Steel Products
ASTM A1016/A1016M	General Requirements for Ferritic Alloy, Austenitic Alloy Steel and Stainless Steel Tubes
ASTM E426	Electromagnetic (Eddy-Current) Testing of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys
ASTM E1417/E1417M	Liquid Penetrant Examination

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751 or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.045
Sulfur	--	0.030
Chromium	18.00	20.00
Nickel	8.00	11.00
Molybdenum	--	0.75
Copper	--	0.75

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.2 Condition

Solution heat treated (8.2.1), cold drawn, pickled as required, and passivated in accordance with AMS2700. Passivation shall be performed after final finishing.

3.3 Fabrication

Tubing shall be produced by either a seamless and drawn process or a welded and drawn process. The specified tensile properties shall be obtained by cold working and not by heat treatment. Surface finishes may be produced by pickling, bright annealing, or any method which will provide the required surface condition, and which will not affect the limits for wall thickness or corrosion resistance, with the exception that centerless, grinding is not acceptable. A light polish to improve external surface appearance or meet surface finish requirements may be employed.

3.3.1 Welded tubing (Type 2) shall be cold reduced after welding to remove any dimensional indication of the presence of welds. A minimum reduction of 30% is recommended.

3.4 Properties

Tubing shall conform to the following requirements:

3.4.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM A370.

Table 2A - Minimum tensile properties, inch/pound units

Nominal OD Inches	Tensile Strength ksi	Yield Strength at 2% Offset ksi	Elongation in 2 Inches Strip %	Elongation in 2 Inches Full Tube %
Up to 5/16, incl	120	75	10	12
Over 5/16	120	75	12	15

Table 2B - Minimum tensile properties, SI units

Nominal OD Millimeters	Tensile Strength MPa	Yield Strength at 2% Offset MPa	Elongation in 50.8 mm Strip %	Elongation in 50 mm Full Tube %
Up to 7.9, incl	827	517	10	12
Over 7.9	827	517	12	15

3.4.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ± 0.002 in/in/min (± 0.002 mm/mm/min) through 0.2% offset yield strain. The strain rate after yield may be increased to any value up to 0.5 in/in/min (or mm/mm/min) or equivalent crosshead speed as a function of gage length.

3.5 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, and scale pattern will not be considered injurious if the imperfections are removable within the tolerances specified for wall thickness; removal of such imperfections is not required.

- 3.5.1 A clean white cloth or plug drawn or blown through the length of the bore of a test sample at least 12 inches (30 cm) in length, shall show no visual evidence of metallic flakes or particles. Discoloration of the cloth, without the presence of flakes or particles, is acceptable. Alternate methods as acceptable to the purchaser, may be used for evaluating tube cleanliness for tubing 0.500 inch (12.7mm) and under ID.
- 3.5.2 When no inspection is specified by the purchaser, tubing shall be subjected to either ultrasonic or eddy current inspection in accordance with ASTM A1016 except that suspect indications shall not be accepted based on visual observation, i.e., indications must be either rejected or reconditioned and retested to pass the test. Alternate methods of inspection may be used when approved by the cognizant engineering organization for tube 0.25 inch (0.64 cm) and under in nominal diameter.
- 3.5.3 When specified by purchaser, tubing shall be subjected to fluorescent penetrant inspection in accordance with ASTM E1417/E1417M, to ultrasonic inspection in accordance with AMS2634, to electromagnetic (eddy-current) testing in accordance with ASTM E426, or to any combination thereof. Tubing shall meet criteria established by the cognizant engineering organization (see 8.6).

3.6 Tolerances

Shall conform to all applicable requirements of AMS2243 for hydraulic tubing.

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.5.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of tubing shall supply all samples for producer'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

All technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

- 4.2.1.1 Nondestructive testing (3.5.2 or 3.5.3 when specified) shall be performed on each finished length of tube. Inspection per 3.5.2 shall become effective one year after publication date.

4.3 Sampling and Testing

Shall be in accordance with AMS2371 except as specified in 4.3.1 and 4.3.1.1.

- 4.3.1 A statistical sampling plan, acceptable to purchaser, may be used in lieu of sampling as in 4.3 and the report of 4.4 shall state that such plan was used.

4.4 Reports

The producer of tubing shall furnish with each shipment a report showing the producer's name and the country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), and the following results of tests and relevant information: