

STEEL TUBING, SEAMLESS, CORROSION AND HEAT RESISTANT
18Cr - 10.5Ni - 0.70 (Cb + Ta) (SAE 30347)
Solution Heat Treated

UNS S34700

1. SCOPE:

- 1.1 Form: This specification covers a corrosion and heat resistant steel in the form of seamless tubing.
- 1.2 Application: Primarily for parts requiring both corrosion and heat resistance, especially when such parts are welded during fabrication. Parts requiring oxidation resistance up to 1500°F (816°C) but useful at that temperature only when stresses are low.

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

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

ASTM A262 - Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

ASTM A370 - Mechanical Testing of Steel Products

ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

ASTM E426 - Electromagnetic (Eddy-Current) Testing of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar 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, 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
Manganese	--	2.00
Silicon	0.30 -	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	17.00 -	19.00
Nickel	9.00 -	12.00
Columbium + Tantalum	10XC -	1.10
Molybdenum	--	0.75
Copper	--	0.75

- 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 seamless process. Any surface 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. Passivation shall follow any polishing treatment.

3.4 Properties: Tubing shall conform to the following requirements; tensile and bend testing shall be performed in accordance with ASTM A370:

3.4.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal OD Inches	Wall Thickness Inches	Tensile Strength psi, max	Elongation in 2 Inches %, minimum	
			Strip	Full Tube
Up to 0.188, incl	Up to 0.016, incl	120,000	-	33
	Over 0.016	105,000	-	35
Over 0.188 to 0.500, incl	Up to 0.010, incl	115,000	30	35
	Over 0.010	105,000	30	35
Over 0.500	Up to 0.010, incl	120,000	25	30
	Over 0.010	105,000	30	35

TABLE I (SI)

Nominal OD Millimetres	Nominal Wall Thickness Millimetres	Tensile Strength MPa, max	Elongation in 50.8 mm %, minimum	
			Strip	Full Tube
Up to 4.78, incl	Up to 0.41, incl	827	-	33
	Over 0.41	724	-	35
Over 4.78 to 12.70, incl	Up to 0.25, incl	793	30	35
	Over 0.25	724	30	35
Over 12.70	Up to 0.25, incl	827	25	30
	Over 0.25	724	30	35

3.4.2 Flarability: Specimens as in 4.3.1 shall withstand flaring at room temperature, without formation of cracks or other visible defects, 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 specified in Table II.

TABLE II

Nominal OD Inches	Expanded OD Inches	Nominal OD Inches	Expanded OD Inches
0.125	0.200	0.750	0.937
0.188	0.302	1.000	1.187
0.250	0.359	1.250	1.500
0.312	0.421	1.500	1.721
0.375	0.484	1.750	2.106
0.500	0.656	2.000	2.356
0.625	0.781		

TABLE II (SI)

Nominal OD Millimetres	Expanded OD Millimetres	Nominal OD Millimetres	Expanded OD Millimetres
3.18	5.08	19.05	23.80
4.78	7.67	25.40	30.15
6.35	9.12	31.75	38.10
7.92	10.69	38.10	43.71
9.52	12.29	44.45	53.49
12.70	16.66	50.80	59.84
15.88	19.84		

- 3.4.2.1 Tubing with nominal OD between any two standard sizes given in 3.4.2 shall take the same percentage flare as shown for the larger of the two sizes.
- 3.4.2.2 Flarability requirements for tubing over 2.000 inches (50.80 mm) or under 0.125 inch (3.18 mm) in nominal OD shall be as agreed upon by purchaser and vendor.
- 3.4.3 Susceptibility to Intergranular Attack: Tubing, after sensitizing treatment, shall pass the intergranular corrosion test performed in accordance with ASTM A262, Practice E.
- 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, 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.
- 3.5.1 Tubing shall be free from grease or other foreign matter. Metallic flakes or particles shall not be collected by a clean white cloth when it is drawn through the length of the bore of a sample tube. Discoloration of the cloth, without the presence of flakes or grit, is acceptable.
- 3.5.2 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 E426, or to any combination thereof. Standards for acceptance shall be as agreed upon by purchaser and vendor.
- 3.6 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).
- 3.7 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. 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), tensile properties (3.4.1), susceptibility to intergranular attack (3.4.3), cleanliness of tubing (3.5.1), nondestructive inspection when specified (3.5.2), and tolerances (3.7) 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 (3.4.2) 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 (3.4.2) 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 for tensile properties of each lot and stating that the tubing conforms to the other technical requirements of this specification. This report shall include the purchase order number, heat number, AMS 5571F, 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 5571F, 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.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Tubing shall be identified as follows:

- 5.1.1 Straight Tubes 0.029 Inch (0.74 mm) and Over in Wall Thickness and 0.500 Inch (12.70 mm) and Over in OD, Minor Axis, or Least Width of Flat Surface: Shall be marked in a row of characters recurring at intervals not greater than 3 feet (914 mm) with AMS 5571F, heat number, manufacturer's identification, and wall thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the tubing or its performance and shall be sufficiently stable to withstand normal handling.
- 5.1.2 Straight Tubes Under 0.029 Inch (0.74 mm) in Wall Thickness or Under 0.500 Inch (12.70 mm) in OD, Minor Axis, or Least Width of Flat Surface: Shall be securely bundled and identified by a durable tag marked with the information of 5.1.1 and the nominal OD and attached to each bundle or shall be boxed and the box marked with the same information.
- 5.1.3 Coiled Tubing: Shall be securely bundled and identified by a durable tag marked with the purchase order number, AMS 5571F, heat number, nominal OD and wall thickness, and manufacturer's identification and attached to each coil or shall be boxed and the box marked with the same information.

5.2 Packaging:

- 5.2.1 Tubing shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the tubing to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Tubing not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

- 8.1 Marginal Indicia: The phi ($\emptyset$) symbol is used to indicate technical changes from the previous issue of this specification.
- 8.2 Dimensions and properties in inch/pound units are primary; dimensions and properties in SI units are shown as the approximate equivalents of the primary units and are presented only for information.