

SAE-AMS5565

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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 5565J

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Superseding AMS 5565H

Submitted for recognition as an American National Standard

STEEL, CORROSION RESISTANT, WELDED TUBING 19Cr - 9.5Ni (SAE 30304) Solution Heat Treated

UNS S30400

1. SCOPE:

1.1 Form:

This specification covers a corrosion-resistant steel in the form of welded tubing.

1.2 Applications:

This tubing has been used typically for parts, such as fluid-conducting lines not subjected to high pressure, requiring good corrosion resistance, but usage is not limited to such applications. Welding, brazing, or other exposure to temperatures over 800 °F (427 °C) during fabrication may impair corrosion resistance.

2. APPLICABLE DOCUMENTS:

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.

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 2634 Ultrasonic Inspection, Thin Wall Metal Tubing
- 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

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2.2 ASTM Publications:

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

ASTM A 262 Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

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) Testing of Seamless and Welded Tubular Products, Austenitic Stainless Steel 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.

TABLE 1 - Composition

Element	min	max
Carbon	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.30
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 requirements of AMS 2248.

3.2 Condition:

(R)

Solution heat treated, free from continuous carbide network, and pickled as required or passivated.

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3.3 Fabrication:

(R)

Tubing 2.00 inches (50.8 mm) and under in nominal OD shall be cold worked after welding to remove any dimensional indication of the presence of the weld. Surface finishing for removal of 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.

3.4 Properties:

Tubing shall conform to the following requirements; tensile and bend testing shall be performed in accordance with ASTM A 370:

3.4.1 Tensile Properties: Shall be as specified in Table 2.

TABLE 2A - Tensile Properties, Inch/Pound Units

Nominal OD Inches	Nominal Wall Thickness Inch	Tensile Strength ksi, max	Elongation in 2 inches %, min Strip	Elongation in 2 inches %, min Full Tube
Up to 0.188, incl	Up to 0.016, incl	115	--	35
	Over 0.016	100	--	40
Over 0.188 to 0.500, incl	Up to 0.010, incl	110	32	37
	Over 0.010	100	35	40
Over 0.500	Up to 0.010, incl	100	27	32
	Over 0.010	100	30	35

TABLE 2B - Tensile Properties, SI Units

Nominal OD Millimeters	Nominal Wall Thickness Millimeters	Tensile Strength MPa, max	Elongation in 50.8 mm %, min Strip	Elongation in 50.8 mm %, min Full Tube
Up to 4.78, incl	Up to 0.41, incl	793	--	35
	Over 0.41	689	--	40
Over 4.78 to 12.70, incl	Up to 0.25, incl	758	32	37
	Over 0.25	689	35	40
Over 12.70	Up to 0.25, incl	689	27	32
	Over 0.25	689	30	35

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- 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 3.

TABLE 3A - Flarability, Inch/Pound Units

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 3B - Flarability, SI Units

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
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 Table 3 shall take the same percentage flare as shown for the larger of the two sizes.
- 3.4.3 Susceptibility to Intergranular Attack: Specimens from tubing, as received, taken to include the weld, shall pass the copper/copper sulfate/sulfuric acid test of ASTM A 262, Practice E.
- 3.4.4 Pressure Test: Tubing shall show no bulges, leaks, pinholes, cracks, or other defects when subjected to an internal hydrostatic pressure, based on nominal dimensions, sufficient to cause a tensile stress of 20.0 ksi (138 MPa) in the tubing wall.

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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 If weld reinforcement is present at the welds on the inner surfaces of tubing over 2.00 inches (R) (50.8 mm) in nominal OD, such weld reinforcement shall be not thicker than 0.010 inch (0.25 mm).

3.5.2 When specified by purchaser, tubing shall be subjected to fluorescent penetrant inspection in (R) accordance with AMS 2645, to ultrasonic inspection in accordance with AMS 2634, to electromagnetic (eddy-current) inspection in accordance with ASTM E 426, or to any combination thereof. Tubing shall meet the requirements of 3.5 and other acceptance criteria established by the cognizant engineering organization.

3.6 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. Purchaser may perform any confirmatory testing deemed necessary to ensure that the tubing conforms to this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.4.1), and tolerances (3.6) are (R) acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Flarability (3.4.2), susceptibility to intergranular attack (3.4.3), and pressure test (R) (3.4.4) 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:

(R)

Shall be in accordance with AMS 2371 and the following:

4.3.1 Specimens for flarability (3.4.2) test 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.