SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-5585 REV D

Issued 1950-10-01
Revised 1991-01-01

Superseding AMS-5585C

Submitted for recognition as an American National Standard

ALLOY TUBING, WELDED, CORROSION AND HEAT RESISTANT
32Fe - 21Cr - 20Ni - 20Co - 3Mo - 2.5W - 1.0(Cb + Ta) - 0.15N
Solution Heat Treated

UNS R30155

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant iron alloy in the form of welded tubing.

1.2 Application: Primarily for parts requiring high strength up to 1500°F (816°C) and oxidation resistance up to 1800°F (982°C).

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.

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-2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock

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

2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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 E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.08 -	0.16
Manganese	1.00 -	2.00
Silicon	--	1.00
Phosphorus	--	0.030
Sulfur	--	0.030
Chromium	20.00 -	22.50
Nickel	19.00 -	21.00
Cobalt	18.50 -	21.00
Molybdenum	2.50 -	3.50
Tungsten	2.00 -	3.00
Columbium + Tantalum	0.75 -	1.25
Nitrogen	0.10 -	0.20
Copper	--	0.50
Iron	remainder	

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 welded and drawn 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 Solution Heat Treatment: Tubing shall be solution heat treated by heating to 2150°F ± 25 (1177°C ± 14) in a suitable protective atmosphere, holding at heat for not less than 15 minutes, and cooling in air.

3.5 Properties: Tubing shall conform to the following requirements:

3.5.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E 8 or ASTM E 8M:

Tensile Strength	100,000 - 140,000 psi (689 - 965 MPa)
Elongation in 2 Inches (50.8 mm), minimum	
Strip	35%
Full Section, tubing OD 0.625 inch (15.88 mm) and over	40%
Full Section, tubing OD under 0.625 inch (15.88 mm)	30%

3.5.2 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 I.

TABLE I

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

TABLE I (SI)

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

3.5.2.1 Tubing with nominal OD between any two standard sizes given in 3.5.2 shall take the same percentage flare as shown for the larger of the two sizes.

3.5.2.2 Flarability requirements for tubing over 2.000 inches (50.80 mm) or under 0.188 inch (4.78 mm) in nominal OD shall be as agreed upon by purchaser and vendor.

3.5.3 Pressure Testing: Tubing shall show no bulges, leaks, pin holes, cracks, or other defects when subjected to an internal hydrostatic pressure (P), based on nominal dimensions, sufficient to cause a tensile stress of 20,000 psi (138 MPa) in the tubing wall. The hydrostatic pressure (P) shall be calculated from the equation:

$$P = 2\frac{ST}{D}$$

where, S = 20,000 psi (138 MPa) tensile stress
T = Minimum wall thickness (nominal thickness minus maximum negative tolerance)
D = Nominal OD

3.6 Quality:

3.6.1 Ø 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 but removal of such imperfections is not required.

3.6.2 If beads are present at the welds on the inner surface of the tubing, such beads shall be not thicker than 0.000 in. (0.25 mm). The outer surfaces of the tubing shall be free from beads.

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 Ø 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 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 for composition (3.1), tensile properties (3.5.1), pressure test (3.5.3), quality (3.6), and tolerances (3.8) are acceptance tests and shall be performed on such heat or lot as applicable.