

AEROSPACE MATERIAL SPECIFICATION



AMS 5585F

Issued OCT 1950
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Reaffirmed APR 2006

Superseding AMS 5585E

Alloy, Corrosion and Heat Resistant, Welded Tubing
32Fe - 21Cr - 20Ni - 20Co - 3Mo - 2.5W - 1.0Cb - 0.15N
Solution Heat Treated

(Composition similar to UNS R30155)

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant alloy in the form of welded and drawn tubing.

1.2 Application:

This tubing has been used typically for parts requiring high strength up to 1500 °F (816 °C) and oxidation resistance up to 1800 °F (982 °C), but usage is not limited to such applications.

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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

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, 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 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, 100 Barr Harbor, West Conshohocken, PA 19428-2959.

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
ASTM E 426	Electromagnetic (Eddy-Current) Examination of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys
ASTM E 1417	Liquid Penetrant Examination

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	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	0.75	1.25
Nitrogen	0.10	0.20
Tantalum	--	0.05
Copper	--	0.50
Iron	remainder	

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2248.

3.2 Condition:

Solution heat treated and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, pickled as required or passivated. Tubing shall have been cold worked sufficiently to ensure proper weld reinforcement height and roundness in the weld reinforcement area.

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 external surface appearance may be employed after solution heat treatment and, if performed, the product shall be subsequently passivated.

3.4 Solution Heat Treatment:

Tubing shall be solution heat treated by heating to $2150^{\circ}\text{F} \pm 25$ ($1177^{\circ}\text{C} \pm 14$) in a suitable protective atmosphere, holding at heat for not less than 15 minutes, and cooling at a rate equivalent to air cooling.

3.5 Properties:

Tubing shall conform to the following requirements:

- 3.5.1 Tensile Properties: Shall be as shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 2 - Tensile Properties

Property	Value
Tensile Strength	100 to 140 ksi (689 to 965 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, min	
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 that specified in Table 3.

TABLE 3A - Minimum Permanent Expanded OD, Inch/Pound Units

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 3B - Minimum Permanent Expanded OD, SI Units

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
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.

3.6 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 grease, oil and other matter, 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 If weld reinforcement is present at the welds on the inner surface of the tubing, such weld reinforcement shall be not thicker than 0.010-inch (0.25-mm). The outer surfaces of the tubing shall be free from weld reinforcement.
- 3.6.2 When specified by purchaser, tubing shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417, 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 acceptance criteria established by the cognizant engineering organization.

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 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:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.5.1), quality (3.6), and tolerances (3.7) are acceptance tests and shall be performed on such heat or lot as applicable.

4.2.2 Periodic Tests: Flarability (3.5.2) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2371 and as follows:

4.3.1 Specimens for flarability test (3.5.2) 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:

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 product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 5585F, size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2371.