Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5585B
Superseding AMS 5585A
Issued 10-1-50
Revised 1-15-78

UNS R30155

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

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 and assemblies requiring high strength up to 1500°F (815°C) and oxidation resistance up to 1800°F (980°C).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

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

ASTM E8 - Tension Testing of Metallic Materials
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

Printed in U.S.A.

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 spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	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 treatment shall follow any polishing treatment.

3.4 Solution Heat Treatment: Tubing shall be solution heat treated by heating to 2150°F ± 25 (1175°C ± 15) in a suitable protective atmosphere, holding at heat for not less than 15 min., 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 E8:

Tensile Strength	100,000 - 140,000 psi (690 - 965 MPa)
Elongation in 2 in. (50 mm)	
Strip	35%
Full Section, tubing OD 0.625 in. (15.88 mm) and over	40%
Full Section, tubing OD under 0.625 in. (15.88 mm)	30%

3.5.2 Flarability: Specimens as in 4.3.1 shall withstand flaring without formation of cracks or other visible defects. The specimen shall, at room temperature, be forced axially with steady pressure over a hardened and polished tapered steel pin having a 74 deg 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	0.290	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	7.37	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 Tubing with nominal OD greater than 2.000 in. (50.80 mm) or less than 0.188 in. (4.78 mm) shall have flarability as agreed upon by purchaser and vendor.

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

3.6 Quality:

3.6.1 Tubing shall be uniform in quality and condition and shall have a finish conforming to the best practice for high quality tubing. It shall be smooth, and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits, and other injurious conditions. 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 surface 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 0.010 in. (0.25 mm), unless otherwise specified. 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 ft (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.8 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2243.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of tubing shall supply all samples 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 perform such confirmatory testing as he deems 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 composition (3.1), tensile property (3.5.1), pressure test (3.5.3), and tolerance (3.8) requirements are classified as acceptance tests.

4.2.2 Periodic Tests: Tests to determine conformance to flarability (3.5.2) requirements are classified as periodic tests.

4.3 Sampling: Shall be in accordance with AMS 2371 and the following:

4.3.1 Specimens for flarability test shall be full tubes or sections cut from tubes. 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 three copies of a report showing the results of tests for chemical composition of each heat and for tensile properties and pressure tests of each size from each heat. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, 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 a statement that the tubing conforms, or shall include 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 In. (0.74 mm) and Over in Nominal Wall Thickness and 0.500 In. (12.70 mm) and Over in Nominal OD, Minor Axis, or Least Width of Flat Surface: Shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with AMS 5585B, heat number, manufacturer's identification, and nominal wall thickness. The characters shall be of such size as to be clearly 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 In. (0.74 mm) in Nominal Wall Thickness or Under 0.500 In. (12.70 mm) in Nominal OD, Minor Axis, or Least Width of Flat Surface: Shall be securely bundled and identified by a durable tag marked with the above information and the nominal OD and attached to each bundle or shall be boxed and the box marked with the same information.