SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5585G

Issued 1950-10
Reaffirmed 2006-04
Revised 2010-01

Superseding AMS5585F

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

(Composition similar to UNS R30155)

RATIONALE

AMS5585G clarifies the requirements for condition (3.2) and weld reinforcement (3.6.1), and results from a Five Year Review and update of this specification.

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

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2243 Tolerances, Corrosion and Heat-Resistant Steel Tubing
AMS2248 Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS2634 Ultrasonic Inspection, Thin Wall Metal Tubing
AMS2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5585G

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E 8/E 8M Tension Testing of Metallic Materials
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 Testing

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 (Niobium)	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 AMS2248.

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 (See 3.6.1) and roundness in the weld area (See 3.7).

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 °F ± 25 (1177 °C ± 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/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 not exceed 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 AMS2634, 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 (See 8.4).

3.7 Tolerances

Shall conform to all applicable requirements of AMS2243.

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 AMS2371 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 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, AMS5585G, size, and quantity.

4.5 Resampling and Retesting

Shall be in accordance with AMS2371.

5. PREPARATION FOR DELIVERY

5.1 Sizes

Except when exact lengths or multiples of exact lengths are ordered, straight tubing will be acceptable in mill lengths of 6 to 20 feet (1.8 to 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).