AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York, N. Y. 10017

AMS 5588A
Superseding AMS 5588

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ALLOY TUBING, WELDED AND DRAWN, CORROSION AND HEAT RESISTANT

Nickel Base - 22Cr - 1.5Co - 9.0Mo - 0.60W - 18.5Fe

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. APPLICATION: Primarily for fluid conducting lines operating under appreciable stresses at high temperatures. Material has good strength up to 1800 F (982 C) and is oxidation resistant up to 2200 F (1204 C).

3. COMPOSITION:

	min	max
Carbon	0.05	0.15
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	20.50	23.00
Cobalt	0.50	2.50
Molybdenum	8.00	10.00
Tungsten	0.20	1.00
Iron	17.00	20.00
Nickel	remainder	

3.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2269.

4. CONDITION: Cold drawn, solution heat treated, and descaled.

4.1 Fabrication: Tubing shall be fabricated from hot or cold rolled strip, fusion welded without addition of filler metal, cold drawn, and solution heat treated. The cold drawing operation on tubing 3.00 in. and under in nominal OD shall result in not less than 15% reduction in wall thickness; the amount of wall thickness reduction on sizes over 3 in. in nominal OD shall be as agreed upon by purchaser and vendor.

5. TECHNICAL REQUIREMENTS:

5.1 Heat Treatment: Unless otherwise specified by purchaser, tubing shall be furnished in the solution heat treated condition conforming to all other technical requirements of this specification. No specific Ø heat treatment is required, but it is recommended that tubing be solution heat treated by heating to 2150 F ± 25 (1176.7 C ± 14), holding at heat for not more than 30 min., and cooling rapidly. In no case shall the solution heat treatment temperature be lower than 2100 F (1149 C).

5.2 Tensile Properties: Tubing having OD of 0.125 in. and over with wall thickness 0.015 in. and over shall conform to the following requirements:

Tensile Strength, psi	100,000 min
Yield Strength at 0.2% Offset or at 0.0070 in. in 2 in. Extension Under Load (E = 30,000,000), psi	45,000 min
Elongation, % in 2 in.	
Strip specimens	20 min
Full section specimens	25 min

5.2.1 Tubing under 0.125 in. in OD or under 0.015 in. in wall thickness shall have properties as agreed upon by purchaser and vendor.

5.3 Flarability: Tubing shall be capable of being flared without formation of cracks or other visible defects. Specimens for flaring may be cut from any portion of the tube, or an entire tube may be used as a specimen. The end of the specimen to be flared shall be cut square, with the cut end smooth and free from burrs, but not rounded. 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 1.2 times the original nominal diameter.

5.4 Pressure Test: Tubing shall show no bulges, leaks, or other defects when subjected to an internal hydrostatic pressure of 5000 psig or pressure sufficient to cause a tensile stress of 40,000 psi in the tubing wall, whichever is less. The hydrostatic pressure (P) shall be based on:

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

where, S = 40,000 psi tensile stress
t = Minimum wall thickness (nominal thickness minus maximum negative tolerance) in inches
D = Nominal OD in inches

5.5 Grain Size: Tubing 0.125 in. and under in wall thickness shall have average grain size of 4 or finer, Ø determined in accordance with the issue of ASTM E112 specified in the latest issue of AMS 2350.

6. QUALITY:

6.1 Tubing shall have a finish conforming to the best practice for high quality aircraft material. Tubing shall be uniform in quality and condition, clean, sound, and free from grease or other foreign matter and from burrs, seams, tears, grooves, laminations, slivers, pits, and other injurious imperfections. External and internal surface imperfections such as handling marks, straightening marks, light mandrel and die marks, shallow pits, seams, scores, and scale pattern will not be considered injurious provided the imperfections are removable within the tolerances specified herein for wall thickness.

6.2 If beads are present at the weld on the inner surface of tubing over 3.00 in. in nominal OD, such beads shall be not thicker than 0.010 in., unless otherwise specified. The outer surface of all tubing and the inner surface of tubing 3.00 in. and under in nominal OD shall be free from beads.

6.3 Tubing shall be subject to nondestructive testing as agreed upon by purchaser and vendor. Standards for acceptance shall be as agreed upon by purchaser and vendor.

7. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of the latest issue of AMS 2263.

8. REPORTS:

8.1 Unless otherwise specified, the vendor of tubing shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and for tensile properties of each size from each heat. This report shall include the purchase order number, material specification number, size, and quantity from each heat.

8.2 Unless otherwise specified, 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, contractor or 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.