AEROSPACE MATERIAL SPECIFICATION

AMS5580	REV. L

Issued 1939-12
Reaffirmed 2012-04
Revised 2015-07

Superseding AMS5580K

Nickel Alloy, Corrosion and Heat-Resistant, Seamless Tubing
74Ni - 15.5Cr - 8.0Fe
Annealed
(Composition similar to UNS N06600)

RATIONALE

AMS5580L revises Fabrication (3.3) to permit bore conditioning, Tensile Properties (3.4.1), Quality (3.5), and Classification of Tests (4.2.1.1), and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant nickel alloy in the form of seamless tubing.

1.2 Application

This tubing has been used typically for parts requiring corrosion and oxidation resistance up to 2000 °F (1093 °C), particularly where such parts may require welding during fabrication, 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2243 Tolerances, Corrosion and Heat-Resistant Steel Tubing

AMS2263 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Tubing

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (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/AMS5580L

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

2.2 ASTM Publications

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

ASTM A1016 Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E354 Chemical Analysis of High Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

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 E354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	min	max
Carbon	--	0.15
Manganese	--	1.00
Silicon	--	0.50
Sulfur	--	0.015
Chromium	14.00	17.00
Nickel	72.00	--
Iron	6.00	10.00
Cobalt	--	1.00
Columbium	--	1.00
Titanium	--	0.50
Aluminum	--	0.35
Copper	--	0.50

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Condition

Tubing shall be supplied in the following condition:

3.2.1 Tubing 6.625 inches (168.28 mm) and under in nominal OD with nominal wall thickness 0.382 inch (9.70 mm) and under shall be cold drawn, annealed, and unless anneal is performed in an atmosphere yielding a bright finish, pickled as required.

3.2.2 Tubing over 6.625 inches (168.28 mm) in nominal OD or over 0.382 inch (9.70 mm) in nominal wall thickness shall be hot finished and annealed, and unless anneal is performed in an atmosphere yielding a bright finish, pickled as required.

3.3 Fabrication

Tubing shall be produced by a seamless process. Any surface finishing operation applied to remove objectionable pits and surface blemishes shall be performed prior to final anneal. A light polish to improve external surface appearance may be employed after anneal. Bore conditioning is permitted after final anneal providing the tubing is not sized by metal removal methods and the tubing is passivated after any such conditioning (See 8.2.1).

3.4 Properties

Tubing shall conform to the following requirements:

3.4.1 Tensile Properties

Shall be as follows, determined in accordance with ASTM E8/E8M.

3.4.1.1 Cold Drawn and Annealed

Shall be as shown in Table 2.

Table 2A - Minimum tensile properties, inch/pound units

Nominal OD Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
Up to 5.000, incl	80.0	35.0	30
Over 5.000 to 6.625, incl	80.0	30.0	35

Table 2B - Minimum tensile properties, SI units

Nominal OD Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 127.00, incl	552	241	30
Over 127.00 to 168.28, incl	552	207	35

3.4.1.2 Hot Finished and Annealed

Shall be as shown in Table 3.

Table 3A - Minimum tensile properties, inch/pound units

Nominal OD Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
2.500 to 5.000, incl	80.0	30.0	35
Over 5.000 to 9.250, incl	75.0	25.0	35

Table 3B - Minimum tensile properties, SI units

Nominal OD Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
63.50 to 127.00, incl	552	207	35
Over 127.00 to 234.95, incl	517	172	35

3.4.2 Flarability

Specimens as in 4.3.1 from cold drawn tubing with nominal OD of 0.188 to 2.000 inches (4.78 to 50.80 mm), inclusive, having nominal wall thickness of 0.125 inch (3.18 mm) and under shall withstand, without formation of cracks or other visible defects, flaring at room temperature 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 1.2 times the original nominal OD.

3.5 Quality

3.5.1 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. Both ID and OD surfaces shall be smooth and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits and other imperfections detrimental to the usage of the tubing. OD surface imperfections, such as handling marks, straightening marks, mandrel or die marks and scale patterns are acceptable providing their depth does not result in violation of minimum wall thickness requirements and their termination is not sharp when viewed by the naked eye.

3.5.2 Tubing shall be subjected to either ultrasonic inspection or to electromagnetic (eddy-current) testing in accordance with ASTM A1016 except that suspect indications shall not be accepted based on visual observation, i.e., indications must be either rejected or reconditioned and retested to pass the test.

3.6 Tolerances

Shall be as follows:

3.6.1 Cold Drawn and Annealed Tubing

Shall conform to all applicable requirements of AMS2263.

3.6.2 Hot Finished and Annealed Tubing

3.6.2.1 Length and Straightness

Shall conform to all applicable requirements of AMS2243.

3.6.2.2 Diameter and Wall Thickness

Shall be as shown in Table 4.

Table 4A - Tolerances, inch/pound units

Nominal OD Inches	OD Tolerance Inch Plus and Minus	Wall Thickness Tolerance % of Nominal Wall Thickness Plus and Minus
2.500 to 5.000, excl	0.031	12.5
5.000 to 9.250, incl	0.047	12.5

Table 4B - Tolerances, SI units

Nominal OD Millimeters	OD Tolerance Millimeters Plus and Minus	Wall Thickness Tolerance % of Nominal Wall Thickness Plus and Minus
63.50 to 127.00, excl	0.79	12.5
127.00 to 234.95, incl	1.19	12.5