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

AEROSPACE MATERIAL SPECIFICATION

AMS 5580F
Superseding AMS 5580E
Issued 12-4-39
Revised 1-15-79

UNS N06600

ALLOY TUBING, SEAMLESS, CORROSION AND HEAT RESISTANT
74Ni - 15.5Cr - 8.0Fe

1. SCOPE:

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

1.2 Application: Primarily for parts and assemblies requiring both corrosion and oxidation resistance, and where such parts may require welding during fabrication. For parts and assemblies requiring oxidation resistance up to 2000°F (1095°C), but useful at the higher temperatures only when stresses are low. Strength at elevated temperatures is similar to that of the 18-8 type of steel.

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 2263 - Tolerances, Nickel, Nickel-Base, and Cobalt-Base Alloy Tubing
AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt 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 E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt 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

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E354, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Carbon	--	0.15
Manganese	--	1.00
Silicon	--	0.50
Sulfur	--	0.015
Chromium	14.00	17.00
Nickel + Cobalt	72.00	--
Iron	6.00	10.00
Cobalt (3.1.1)	--	1.00
Columbium + Tantalum (3.1.1)	--	1.00
Titanium (3.1.1)	--	0.50
Aluminum (3.1.1)	--	0.35
Copper	--	0.50

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

3.2 Condition: Tubing shall be supplied in the following condition:

3.2.1 Tubing 6.625 in. (168.28 mm) and under in nominal OD with nominal wall thickness 0.382 in. (9.70 mm) and under shall be cold drawn, annealed, and pickled if necessary.

3.2.2 Tubing over 6.625 in. (168.28 mm) in nominal OD or over 0.382 in. (9.70 mm) nominal wall thickness shall be hot finished and annealed.

3.3 Fabrication: Tubing shall be produced by a seamless process. The external and internal surface finishes may be produced by pickling, bright annealing, or any method which will provide the required surface condition and which will not affect limits of wall thickness or corrosion resistance, with the exception that centerless ground finish is not acceptable. A light polish to improve surface appearance may be employed.

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:

3.4.1.1 Cold Drawn:

TABLE I

Nominal OD Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. %, min.
Up to 5.000, incl	80,000	35,000	30
Over 5.000 to 6.625, incl	80,000	30,000	35

TABLE I (SI)

Nominal OD Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm %, min
Up to 127.00, incl	552	241	30
Over 127.00 to 168.28, incl	552	207	35

3 4.1.2 Hot Finished:

TABLE II

Nominal OD Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. %, min
2.500 to 5.000, incl	80,000	30,000	35
Over 5.000 to 9.250, incl	75,000	25,000	35

TABLE II (SI)

Nominal OD Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm %, min
63.50 to 127.00, incl	552	207	35
Over 127.00 to 234.95, incl	517	172	35

3.4.2 Flarability: Cold drawn tubing with nominal OD of 0.188 - 2.000 in. (4.78 - 50.80 mm), incl, having nominal wall thickness of 0.125 in. (3.18 mm) and under shall withstand flaring, without formation of cracks or other visible defects, by being forced axially at room temperature 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 1.3 times the original nominal OD.

3.4.2.1 Flarability requirements for cold drawn tubing having nominal wall thickness of 0.125 in. (3.18 mm) and under with nominal OD greater than 2.000 in. (50.80 mm) or less than 0.188 in. (4.78 mm) shall be as agreed upon by purchaser and vendor.

3.5 Quality:

3.5.1 Ø Cold drawn 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 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.

3.5.2 Ø Hot finished tubing, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the tubing.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight tubing will be ø 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).

3.7. Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

3.7.1 Cold Drawn Tubing: AMS 2263.

3.7.2 Hot Finished Tubing:

3.7.2.1 Length and Straightness: AMS 2263.

3.7.2.2 Diameter and Wall Thickness: Shall be as specified in Table III.

TABLE III

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 III (SI)

Nominal OD Millimetres	OD Tolerance Millimetres plus and minus	Wall Thickness Tolerance % of Nominal Wall Thickness plus and minus
63.50 to 127.00, excl	0.80	12.5
127.00 to 234.95, incl	1.20	12.5

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 ø 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 requirements for composition (3.1), tensile properties (3.4.1), and tolerances (3.7) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for flarability (3.4.2) are ø classified as periodic tests and shall be performed at a frequency selected by the manufacturer unless frequency of testing is specified by purchaser.

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

4.3.1 Specimens for flarability test (3.4.2) 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.