SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4574E

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Superseding AMS 4574D

Nickel-Copper Alloy, Corrosion Resistant, Tubing, Seamless
67Ni - 31Cu
Annealed

(Composition similar to UNS N04400)

1. SCOPE:

1.1 Form:

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

1.2 Application:

This product has been used typically for fluid lines, such as primer and fuel lines, requiring corrosion resistance with relatively high strength, 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2263	Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Tubing
AMS 2269	Chemical Check Analysis Limits, Wrought Nickel, Nickel Alloys, and Cobalt Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

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**

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM E 8 Tension Testing of Metallic Materials
ASTM E 8M Tension Testing of Metallic Materials (Metric)
ASTM E 76 Chemical Analysis of Nickel-Copper 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 E 76 or by spectrochemical or other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	--	0.3
Manganese	--	2.0
Silicon	--	0.5
Sulfur	--	0.024
Copper	28.0	34.00
Iron	--	2.5
Nickel	remainder	

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

3.2 Condition:

Cold drawn and annealed.

3.3 Properties:

Tubing shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 2 - Tensile Properties

Property	Value
Tensile Strength, maximum	85 ksi (586 MPa)
Elongation in 2 inches (50.8 mm) or 4D, minimum	32%

3.3.2 Flarability: Tubing shall withstand flaring, without formation of cracks or other visible defects, by being forced, at room temperature, 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 shown in Table 3.

TABLE 3A - Minimum Expanded OD, Inch/Pound Units

Nominal OD Inches	Expanded OD Inches	Nominal OD Inches	Expanded OD Inches
0.125	0.200	1.000	1.187
0.188	0.290	1.250	1.500
0.250	0.359	1.500	1.721
0.312	0.421	1.750	2.106
0.375	0.484	2.000	2.356
0.500	0.656	2.500	2.856
0.625	0.781	3.000	3.356
0.750	0.937		

TABLE 3B - Minimum Expanded OD, SI Units

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
3.18	5.08	25.40	30.15
4.78	7.37	31.75	38.10
6.35	9.12	38.10	43.71
7.92	10.69	44.45	53.49
9.53	12.29	50.80	59.84
12.70	16.66	63.50	72.54
15.88	19.84	76.20	85.24
19.05	23.80		

3.3.2.1 Tubing with nominal OD between any two standard sizes shown in Table 3 shall take the same percentage flare as shown for the larger of the two sizes.

3.3.3 Pressure Test: Tubing shall show no bulges, leaks, pinholes, cracks, or other defects when subjected to an internal hydrostatic pressure (P), calculated from equation 1.

$$P = \frac{2St}{D} \qquad \text{(Eq. 1)}$$

where, P = Test pressure
S = 17.5 ksi (121 MPa)
t = Minimum wall thickness
D = Nominal OD

3.4 Quality:

Tubing, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the tubing.

3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2263.

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 (3.3.1), and tolerances (3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Flarability (3.3.2) and pressure test (3.3.3) are periodic tests 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 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:

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 tubing conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 4574E, size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2371.