# AEROSPACE MATERIAL SPECIFICATION

| AMS4574™ | REV. F |
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Issued 1948-05
Revised 2017-01
Reaffirmed 2022-02

Superseding AMS4574E

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

(Composition similar to UNS N04400)

RATIONALE

AMS4574F revises Composition (3.1), Quality (3.4.2), and Reports (4.4), and is a Five-Year Review and update of this specification.

## 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 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.

| | |
|---|---|
| AMS2263 | Tolerances Nickel, Nickel Alloy, and Cobalt Alloy Tubing |
| AMS2269 | Chemical Check Analysis Limits Nickel, Nickel Alloys, and Cobalt Alloys |
| AMS2371 | Quality Assurance Sampling and Testing Corrosion and Heat-Resistant Steels and Alloys Wrought Products and Forging Stock |
| ARP1917 | Clarification of Terms Used in Aerospace Metals Specifications |





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**SAE WEB ADDRESS: http://www.sae.org**

**For more information on this standard, visit**
https://www.sae.org/standards/content/AMS4574F/

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 General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E1473 Chemical Analysis of Nickel, Cobalt, and High-Temperature 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 E1473 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 AMS2269.

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 E8/E8M.

***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° included angle to produce a flare having a permanent expanded OD not less than shown in Table 3.

***Table 3***

***Table 3A - Minimum expanded OD, inch/pound units***

| Nominal OD Inch | Expanded OD Inch | 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.

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

where,

P = test pressure
S = 17.5 ksi (121 MPa)
t = minimum wall thickness
D = nominal OD

3.4 Quality

3.4.1 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.

3.4.2 Tubing shall be subjected to either ultrasonic or eddy current inspection 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 (see 8.4).

3.5 Tolerances

Shall conform to all applicable requirements of AMS2263.

## 4. QUALITY ASSURANCE PROVISIONS

### 4.1 Responsibility for Inspection

The producer of tubing shall supply all samples for producer'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), quality (3.4.2), 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 producer unless frequency of testing is specified by purchaser.

### 4.3 Sampling and Testing

Shall be in accordance with AMS2371 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 producer of tubing shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations) and 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, AMS4574F, size, and quantity.

### 4.5 Resampling and Retesting

Shall be in accordance with AMS2371.

## 5. PREPARATION FOR DELIVERY

### 5.1 Identification

Tubing shall be identified as follows:

5.1.1 Straight Tubes 0.029 Inch (0.74 mm) and Over in Wall Thickness and 0.500 Inch (12.70 mm) and Over in OD, Minor Axis, or Least Width of Flat Surface

Shall be marked in a row of characters recurring at intervals not greater than 3 feet (914 mm) with AMS4574F, and manufacturer's identification, and nominal wall thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the tubing or its performance and shall be sufficiently stable to withstand normal handling.

5.1.2 Straight Tubes Under 0.029 Inch (0.74 mm) in Wall Thickness or Under 0.500 Inch (12.70 mm) in OD

Shall be securely bundled and identified by a durable tag marked with the information of 5.1.1 and the nominal OD and attached to each bundle or shall be boxed and the box marked with the same information.