AEROSPACE MATERIAL SPECIFICATION

AMS4677™	REV. C

Issued 1970-05
Revised 2017-01
Reaffirmed 2022-02

Superseding AMS4677B

Nickel-Copper Alloy, Corrosion Resistant, Bars and Forgings
66.5Ni - 2.9Al - 30Cu
Annealed

(Composition similar to UNS N05502)

RATIONALE

AMS4677C revises Composition (3.1), Condition (3.2.2), 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 bars, forgings, and forging stock.

1.2 Application

These products have been used typically for parts requiring moderate strength, corrosion resistance, and very good machinability, 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.

AMS2261 Tolerances Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire

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

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4677C/

AMS2374 Quality Assurance Sampling and Testing Corrosion and Heat-Resistant Steel and Alloy Forgings

AMS2806 Identification Bars, Wire, Mechanical Tubing, and Extrusions Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys

AMS2808 Identification Forgings

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

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 E8/E8M Tension Testing of Metallic Materials

ASTM E10 Brinell Hardness of Metallic Materials

ASTM E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness Rockwell Hardness

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	--	0.10
Manganese	--	1.5
Silicon	--	0.5
Phosphorus (3.1.1)	--	0.02
Sulfur	--	0.010
Copper	27.00	33.0
Aluminum	2.3	3.5
Iron	--	2.0
Titanium	--	0.5
Zinc (3.1.1)	--	0.02
Lead (3.1.1)	--	0.006
Tin (3.1.1)	--	0.006
Nickel	remainder	

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Bars and Forgings

Hot finished and annealed.

3.2.1.1 Round bars shall be ground or turned.

3.2.2 Bars shall not be cut from plate (also see 4.4.1).

3.2.3 Forging Stock

As ordered by the forging manufacturer.

3.3 Properties

The product shall conform to the following requirements:

3.3.1 Bars and Forgings as Annealed

3.3.1.1 Hardness

Shall be not higher than 187 HB, or equivalent (see 8.2), determined in accordance with ASTM E10.

3.3.2 Bars and Forgings After Precipitation Heat Treatment

Bars and forgings shall have the following properties after being precipitation heat treated by heating to 1150 °F ± 25 °F (621 °C ± 15 °C), holding at heat for 2 hours ± 0.25 hour, furnace cooling to 1050 °F ± 25 °F (565 °C ± 15 °C), holding at 1050 °F ± 25 °F (565 °C ± 15 °C) for 4 hours ± 0.25 hour, furnace cooling to 950 °F ± 25 °F (510 °C ± 15 °C), holding at 950 °F ± 25 °F (510 °C ± 15 °C) for 4 hours ± 0.25 hour, and cooling to room temperature at a rate equivalent to air cooling.

3.3.2.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E8/E8M on product 4.500 inches (112.50 mm) and under in nominal diameter or least distance between parallel sides.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	130 ksi (896 MPa)
Yield Strength at 0.2% Offset	80 ksi (551 MPa)
Elongation in 4D	20%

3.3.2.2 Hardness

Shall be not lower than 235 HB, or equivalent (see 8.2), determined in accordance with ASTM E10. The product shall not be rejected on the basis of hardness if the tensile properties of 3.3.2.1 are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.

3.3.3 Forging Stock

When a sample of stock is forged to a test coupon, annealed, and precipitation heat treated as in 3.3.2, specimens taken from the heat-treated coupon shall conform to the requirements of 3.3.2.1 and 3.3.2.2. If specimens taken from the stock after annealing and precipitation heat treatment as in 3.3.2 conform to the requirements of 3.3.2.1 and 3.3.2.2, the tests shall be accepted as equivalent to tests of a forged coupon.

3.4 Quality

The product, 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 product.

3.5 Tolerances

Bars shall conform to all applicable requirements of AMS2261.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product 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 product conforms to specified requirements.

4.2 Classification of Tests

All technical requirements of this specification are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 Bars and Forging Stock

In accordance with AMS2371.

4.3.2 Forgings and Forging Stock

In accordance with AMS2374.

4.4 Reports

The producer of the product 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 bars and forgings after precipitation heat treatment and for hardness of bars and forgings as annealed and after precipitation heat treatment from each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS4677C, size, and quantity from each heat. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.4.1 Report the nominal metallurgically worked cross sectional size and the cut size, if different (also see 3.2.2).

4.4.2 The producer of forging stock 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, and of any additional property requirements imposed by 8.5. This report shall include the purchase order number, heat and lot numbers, AMS4677C, product form and size or part number, and quantity.

4.5 Resampling and Retesting

If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.