SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4677B

Issued MAY 1970
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Reaffirmed MAY 2008

Superseding AMS 4677A

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

(Composition similar to UNS N05502)

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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2261	Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire
AMS 2269	Chemical Check Analysis Limits, 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
AMS 2374	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steel and Alloy Forgings

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**

2.1 (Continued):

AMS 2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys
AMS 2808 Identification, Forgings

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 10 Brinell Hardness of Metallic Materials
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	--	0.10
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 AMS 2269.

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 round or turned.

3.2.2 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 E 10.

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 (621 °C ± 15), holding at heat for 2 hours ± 0.25, furnace cooling to 1050 °F ± 25 (565 °C ± 15), holding at 1050 °F ± 25 (565 °C ± 15) for 4 hours ± 0.25, furnace cooling to 950 °F ± 25 (510 °C ± 15), holding at 950 °F ± 25 (510 °C ± 15) for 4 hours ± 0.25, and cooling to room temperature at a rate equvalent to air cooling.

3.3.2.1 Tensile Properties: Shall be as shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M 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 E 10. 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 AMS 2261.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product 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 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 AMS 2371.

4.3.2 Forgings and Forging Stock: In accordance with AMS 2374.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing 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, AMS 4677B, 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.

4.5 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.