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

AEROSPACE MATERIAL SPECIFICATION

AMS 4674D
Superseding AMS 4674C
Issued 5-1-48
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UNS N04405

ALLOY BARS AND FORGINGS, CORROSION RESISTANT
67Ni - 30Cu - 0.04S
Free Machining

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: Primarily for fittings, such as cones, nipples, and unions, in fluid line assemblies using AMS 4574 or AMS 4575 tubing. This material can be machined more readily than AMS 4675.

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, Pennsylvania 15096.

2.1.1 Aerospace Material Specifications:

AMS 2261 - Tolerances, Nickel, Nickel Base, and Cobalt Base Alloy Bars and Forging Stock
AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel and Nickel Base Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings
AMS 2808 - Identification, Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM E8 - Tension Testing of Metallic Materials
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E76 - Chemical Analysis of Nickel-Copper Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical Ø methods in accordance with ASTM E76, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min		max
Nickel + Cobalt	63.00	-	70.00
Sulfur	0.025	-	0.06
Iron	--		2.50
Manganese	--		2.00
Cobalt (3.1.1)	--		1.00
Silicon	--		0.50
Carbon	--		0.30
Copper	remainder		

3.1.1 Determination not required for routine acceptance.

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

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Bars: Cold finished.

3.2.2 Forgings: As forged.

Ø 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:

3.3.1.1 Tensile Properties, Round Bars: Shall be as shown in Table I, determined in accordance with Ø ASTM E8:

TABLE I

Nominal Diameter Inches	Tensile Strength psi	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.50, excl	85,000 - 110,000	50,000	8
0.50 to 1.00, incl	85,000 - 110,000	50,000	15
Over 1.00 to 3.00, incl	85,000 --	50,000	15

TABLE I (SI)

Nominal Diameter Millimetres	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 12.7, excl	586 - 758	345	8
12.7 to 25.4, incl	586 - 758	345	15
25.4 to 76.2, incl	586 --	345	15

3.3.1.2 Tensile Properties, Hexagons, Squares, Rectangles: Shall be as shown in Table II, determined Ø in accordance with ASTM E8:

TABLE II

Nominal Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.50, excl	85,000	50,000	10
0.50 to 2.00, incl	85,000	50,000	15

TABLE II (SI)

Nominal Distance Between Parallel Sides Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 12.7, excl	586	345	10
12.7 to 50.8, incl	586	345	15

3.3.1.3 Hardness: Should be not lower than the following or equivalent, determined in accordance with Ø ASTM E18, but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.

Rounds	84 HRB
Hexagons, Squares, Rectangles	80 HRB

3.3.2 Forgings: Shall have hardness of 78 - 96 HRB or equivalent, determined in accordance with Ø ASTM E18.

3.4 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.5 Tolerances: Tolerances for bars and forging stock 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 and shall be responsi- Ø ble for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specifi- Ø cation are classified as acceptance or routine control tests.

Ø 4.3 Sampling: Shall be in accordance with the following:

Ø 4.3.1 Bars: AMS 2371.

Ø 4.3.2 Forgings and Forging Stock: As agreed upon by purchaser and vendor.

4.4 Reports:

4.4.1 Ø The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and the results of tests on each size from each heat to determine conformance to the tensile property (bars) and hardness (forgings) requirements of this specification. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Ø 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 and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Bars:

5.1.1.1 Ø Each straight bar over 0.500 in. (12.70 mm) in diameter or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with AMS 4674D, heat number, and manufacturer's identification. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1.2 Straight bars 0.500 in. (12.70 mm) and under in diameter or least width of flat surface shall be securely bundled and identified by a durable tag marked with the purchase order number, AMS 4674D, heat number, nominal size, and manufacturer's identification and attached to each bundle or shall be boxed and the box marked with the same information.

5.1.1.3 Ø Coiled bars shall be securely bundled and identified by a durable tag marked with the purchase order number, AMS 4674D, heat number, nominal size, and manufacturer's identification and attached to each coil or shall be boxed and the box marked with the same information.

5.1.2 Forgings: In accordance with AMS 2808.

Ø 5.1.3 Forging Stock: As agreed upon by purchaser and vendor.

5.2 Ø Packaging: The product shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.