



# AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

## SPECIFICATION

### AMS5607A

Superseding AMS 5607

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UNS N10003

ALLOY SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT  
73Ni - 7.0Cr - 16.5Mo

#### 1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant nickel alloy in the form of sheet, strip, and plate.

1.2 Application: Primarily for formed and drawn parts requiring moderate strength up to 1400° F (760° C) and oxidation resistance up to 1600° F (870° C), particularly where a low coefficient of expansion is desirable.

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, PA 15096.

##### 2.1.1 Aerospace Material Specifications:

AMS 2262 - Tolerances, Nickel, Nickel-Base, and Cobalt-Base Alloy Sheet, Strip, and Plate

AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

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

ASTM E8 - Tension Testing of Metallic Materials

ASTM E139 - Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials

ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

ASTM E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

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

##### 2.3.1 Federal Standards:

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

##### 2.3.2 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

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3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E354, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

|                     | min       | max   |
|---------------------|-----------|-------|
| Carbon              | 0.04 -    | 0.08  |
| Manganese           | --        | 1.00  |
| Silicon             | ---       | 1.00  |
| Phosphorus          | --        | 0.015 |
| Sulfur              | --        | 0.020 |
| Chromium            | 6.00 -    | 8.00  |
| Molybdenum          | 15.75 -   | 17.25 |
| Cobalt              | --        | 0.20  |
| Tungsten            | --        | 0.50  |
| Aluminum + Titanium | --        | 0.50  |
| Boron               | --        | 0.01  |
| Iron                | --        | 5.00  |
| Copper              | --        | 0.35  |
| Nickel              | remainder |       |

- 3.1.1 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 Sheet and Strip: Hot or cold rolled, solution heat treated, and descaled unless solution heat treatment is performed in an atmosphere yielding a bright finish, having a surface appearance comparable to a commercial corrosion-resistant steel No. 1 finish; standards for acceptance shall be as agreed upon by purchaser and vendor.

- 3.2.2 Plate: Hot rolled, solution heat treated, and descaled.

- 3.3 Heat Treatment: The product shall be solution heat treated by heating to  $2150^{\circ}\text{F} \pm 25$  ( $1175^{\circ}\text{C} \pm 15$ ), holding at heat for a time commensurate with section thickness but not more than 30 min., and cooling rapidly in air.

- 3.4 Properties: The product shall conform to the following requirements:

- 3.4.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8:

|                                        |                       |
|----------------------------------------|-----------------------|
| Tensile Strength, min                  | 100,000 psi (690 MPa) |
| Yield Strength at 0.2% Offset, min     | 40,000 psi (276 MPa)  |
| Elongation in 2 in. (50 mm) or 4D, min | 40%                   |

- 3.4.2 Bending: Product 0.187 in. (4.75 mm) and under in nominal thickness shall withstand, without cracking, bending in accordance with ASTM E290 at room temperature through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

| Nominal Thickness         |                           | Bend Factor |
|---------------------------|---------------------------|-------------|
| Inch                      | (Millimetres)             |             |
| Up to 0.050, incl         | (Up to 1.27, incl)        | 1.5         |
| Over 0.050 to 0.187, incl | (Over 1.27 to 4.75, incl) | 2           |

- 3.4.2.1 Bending requirements for product over 0.187 in. (4.75 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.
- 3.4.3 Stress-Rupture Properties at 1500°F (816°C): A tensile test specimen, maintained at 1500°F  $\pm$  3 (816°C  $\pm$  2) while a load sufficient to produce an initial axial stress of 13,000 psi (89.6 MPa) is applied continuously, shall not rupture in less than 23 hours. The test shall be continued to rupture without change of load. Elongation after rupture, measured at room temperature, shall be not less than 8% in 2 in. (50 mm) or 4D. Tests shall be conducted in accordance with ASTM E139.
- 3.4.3.1 The test of 3.4.3 may be conducted using a load higher than required to produce an initial axial stress of 13,000 psi (89.6 MPa) but load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as specified in 3.4.3.
- 3.4.3.2 When permitted by purchaser, the test of 3.4.3 may be conducted using incremental loading. In such case, the load required to produce an initial axial stress of 13,000 psi (89.6 MPa) shall be used to rupture or for 23 hr, whichever occurs first. After the 23 hr and at intervals of 8 - 16 hr, preferably 8 - 10 hr, thereafter, the stress shall be increased in increments of 2000 psi (13.8 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.3.
- 3.5 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.
- 3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2262.
4. QUALITY ASSURANCE PROVISIONS:
- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible 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 ensure 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 specification are classified as acceptance tests and shall be performed on each lot.
- 4.3 Sampling: Shall be in accordance with AMS 2371 and the following:
- 4.3.1 Specimens for tensile tests of widths 9 in. (229 mm) and over shall be taken with the axis of the specimen perpendicular to the direction of rolling; for widths less than 9 in. (229 mm), specimens shall be taken with the axis parallel to the direction of rolling.
- 4.4 Reports:
- 4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and for tensile, bending, and stress-rupture properties of each size from each heat. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat.
- 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.