

# AEROSPACE MATERIAL SPECIFICATION



AMS 5607D

Issued MAY 1971  
Revised DEC 1995

Superseding AMS 5607C

Submitted for recognition as an American National Standard

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

UNS N10003

## 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:

These products have been used typically for parts requiring moderate strength up to 1400 °F (760 °C) and oxidation resistance up to 1600 °F (871 °C), particularly where a low coefficient of expansion is desirable, but usage is not limited to such applications.

## 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

### 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

|          |                                                                                                                                       |
|----------|---------------------------------------------------------------------------------------------------------------------------------------|
| AMS 2262 | Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate                                                            |
| MAM 2262 | Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate                                                    |
| 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 2807 | Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing |

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user"

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled SAE invites your written comments and suggestions.

Copyright 1995 Society of Automotive Engineers, Inc.  
All rights reserved

Printed in U.S.A.

## 2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM E 8 Tension Testing of Metallic Materials
- ASTM E 8M Tension Testing of Metallic Materials (Metric)
- ASTM E 139 Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
- ASTM E 290 Semi-Guided Bend Test for Ductility of Metallic Materials
- ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

## 2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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

## 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 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

| Element             | 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, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to the following commercial corrosion-resistant steel finishes, as applicable (See 8.2).

3.2.1.1 Sheet: No. 2D finish.

3.2.1.2 Strip: No. 1 strip finish.

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  $2150^{\circ}\text{F} \pm 25$  ( $1177^{\circ}\text{C} \pm 14$ ), holding at heat for a time commensurate with section thickness but not more than 30 minutes, and cooling at a rate equivalent to an air cool or faster.

### 3.4 Properties:

The product shall conform to the following requirements:

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

TABLE 2 - Minimum Tensile Properties

| Property                               | Value              |
|----------------------------------------|--------------------|
| Tensile Strength                       | 100 ksi (689 MPa)  |
| Yield Strength at 0.2% Offset          | 40.0 ksi (276 MPa) |
| Elongation in 2 Inches (50.8 mm) or 4D | 40%                |

3.4.2 Bending: Product shall withstand, without cracking, bending at room temperature in accordance with ASTM E 290 through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 3 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 3 - Bending Parameters

| Nominal Thickness<br>Inch  | Nominal Thickness<br>Millimeters | Bend<br>Factor |
|----------------------------|----------------------------------|----------------|
| Up to 0.050, incl          | Up to 1.27, incl                 | 1.5            |
| Over 0.050 to 0.1874, incl | Over 1.27 to 4.760, incl         | 2              |

3.4.3 Stress-Rupture Properties at 1500 °F (816 °C): A tensile specimen, maintained at 1500 °F  $\pm$  3 (816 °C  $\pm$  2) while a load sufficient to produce an initial axial stress of 13.0 ksi (90 MPa) or higher 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 inches (50.8 mm) or 4D. Tests shall be conducted in accordance with ASTM E 139.

3.4.3.1 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 13.0 ksi (90 MPa) or higher shall be used for 23 hours or to rupture, whichever occurs first. After the 23 hours and at intervals of 8 to 16 hours, preferably 8 to 10 hours, thereafter, the stress shall be increased in increments of 2.0 ksi (14 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 imperfections detrimental to usage of the product.

### 3.6 Tolerances:

Shall conform to all applicable requirements of AMS 2262 or MAM 2262.

## 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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

### 4.2 Classification of Tests:

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

### 4.3 Sampling and Testing:

Shall be in accordance with AMS 2371.