

# AEROSPACE MATERIAL SPECIFICATION

**SAE**

AMS 5845E

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Superseding AMS 5845D

Submitted for recognition as an American National Standard

ALLOY, CORROSION RESISTANT, BARS  
20Cr - 35Ni - 35Co - 10Mo  
Vacuum Induction Plus Consumable Electrode Vacuum Melted  
Solution Heat Treated, Work Strengthened, and Aged

UNS R30035

## 1. SCOPE:

### 1.1 Form:

This specification covers a corrosion-resistant alloy in the form of bars.

### 1.2 Application:

These bars have been used typically for parts requiring a combination of high strength, good tension-tension fatigue strength, toughness, ductility, and exceptionally good corrosion resistance (See 8.2), 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 2261	Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire
MAM 2261	Tolerances, Metric, 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 2750	Pyrometry
AMS 2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys

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## 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 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 112	Determining the Average Grain Size
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	--	0.025
Manganese	--	0.15
Silicon	--	0.15
Phosphorus	--	0.015
Sulfur	--	0.010
Chromium	19.00	21 .00
Nickel	33.00	37.00
Molybdenum	9.00	10.50
Titanium	--	1 .00
Iron	--	1 .00
Cobalt	remainder	

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

## 3.2 Melting Practice:

Alloy shall be multiple melted using vacuum induction melting plus consumable electrode vacuum remelting practice.

## 3.3 Condition:

Solution heat treated, work strengthened, aged, and centerless ground.

## 3.4 Heat Treatment:

(R)

Bars shall be solution heat treated by heating to a temperature within the range 1900 to 1925 °F (1038 to 1052 °C), holding at the selected temperature within  $\pm 25$  °F ( $\pm 14$  °C) for 4 to 8 hours, and cooling in air to room temperature. Pyrometry for solution heat treatment shall be in accordance with AMS 2750. After cold drawing, the bars shall be aged by heating to a temperature within the range 1000 to 1200 °F (538 to 649 °C), holding at the selected temperature within  $\pm 25$  °F ( $\pm 14$  °C) for 4 to 4-1/2 hours, and cooling in air to room temperature.

## 3.5 Properties:

(R)

Bars 1-3/4 inches (44.4 mm) and under in nominal diameter shall conform to the following requirements (See 8.2).

3.5.1 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	260 ksi (1793 MPa)
Yield Strength at 0.2% Offset	230 ksi (1586 MPa)
Elongation in 4D	8 %
Reduction of Area	35%

3.5.2 Hardness: Shall be not lower than 44 HRC, or equivalent (See 8.3), determined in accordance with ASTM E 18. Product shall not be rejected on the basis of hardness if the tensile properties of 3.5.1, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness, are acceptable.

(R)

3.5.3 Average Grain Size: Shall be ASTM No. 4 or finer, determined in accordance with ASTM E 112 (See 8.4).

(R)

### 3.6 Quality:

Bars, 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 bars.

### 3.7 Tolerances:

Shall conform to all applicable requirements of AMS 2261 or MAM 2261.

## 4. QUALITY ASSURANCE PROVISIONS:

### 4.1 Responsibility for Inspection:

The vendor of bars 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 bars conform 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 and the following:

- 4.3.1 Specimens for tensile testing (3.51) shall be of standard proportions in accordance with ASTM E 8 or ASTM E 8M with either 0.250 inch (6.35 mm) diameter at the reduced parallel gage section or smaller specimens proportional to the standard when required. Specimens shall be machined from the center of bars 0.800 inch (20.32 mm) and under in nominal diameter or distance between parallel sides and from mid-radius of larger size bars.

### 4.4 Reports:

The vendor of bars shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile properties, hardness, and average grain size of each lot. This report shall include the purchase order number, heat and lot numbers, AMS 5845E, size, quantity, and a statement of record of specific temperature and time used in the age cycle.

### 4.5 Resampling and Retesting:

Shall be in accordance with AMS 2371.