The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5845D

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Superseding AMS 5845C

ALLOY BARS, CORROSION RESISTANT
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: Primarily for applications requiring a combination of high strength, good tension-tension fatigue strength, toughness, ductility, and exceptionally good corrosion resistance.

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 as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2261 - Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars
MAM 2261 - Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Bars
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 Steels and Alloys, Wrought Products Except Forgings and Forging Stock
AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

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 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 Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, Ø determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

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

3.3 Heat Treatment: Bars shall be solution heat treated by heating to a temperature within the range 1900° - 1925°F (1038° - 1052°C), holding at the selected temperature within ±25°F (±14°C) for 4 - 8 hours, and cooling in air to room temperature. After cold drawing, the bars shall be aged by heating to a temperature within the range 1000° - 1200°F (538° - 649°C), holding at the selected temperature within ±25°F (±14°C) for 4 - 4-1/2 hours, and cooling in air to room temperature.

3.4 Properties: Bars 1-3/4 inches (44.4 mm) and under in nominal diameter shall conform to the following requirements (See 8.2); properties of bars over 1-3/4 inches (44.4 mm) in nominal diameter shall be as agreed upon by purchaser and vendor:

3.4.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E 8 or ASTM E 8M:

Tensile Strength, minimum	260,000 psi (1793 MPa)
Yield Strength at 2% Offset, minimum	230,000 psi (1586 MPa)
Elongation in 4D, minimum	8%
Reduction of Area, minimum	35%

3.4.2 Hardness: Should be not lower than 44 HRC, or equivalent, determined in accordance with ASTM E 18 but bars shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.1 are met.

3.4.3 Grain Size: Predominantly 4 or finer with occasional grains as large as 2 permissible, determined by comparison of a polished and etched specimen with the chart in ASTM E 112.

3.5 Quality:

3.5.1 Alloy shall be produced by multiple melting using vacuum induction followed by consumable electrode vacuum melting practice.

3.5.2 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.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars will be acceptable in mill lengths of 6 - 20 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

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. Results of such tests shall be reported to the purchaser as required by 4.4. 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: Tests for 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 Ø following; the number of specimens to be sampled shall be the minimum number of specimens tested. A heat shall be the consumable electrode remelted ingots produced from alloy originally melted as a single furnace charge; a lot shall be all bars of one size from one heat solution heat treated, cold drawn, and aged as a batch.

4.3.1 Specimens for tensile testing 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 grain size of each lot. This report shall include the purchase order number, lot number, AMS 5845D, 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.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Shall be in accordance with AMS 2806.

5.2 Packaging:

5.2.1 Bars shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the bars to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.

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

7. REJECTIONS: Bars not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.