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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5745D

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Superseding AMS 5745C

Submitted for recognition as an American National Standard

STEEL, CORROSION AND HEAT RESISTANT, BARS AND FORGINGS 16.5Cr - 4.5Ni - 2.9Mo - 0.1ON Equalized and Over-Tempered

UNS S35000

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant steel in the form of bars, forgings, and forging stock.

1.2 Application:

These products have been used typically for parts requiring oxidation resistance and high strength up to 800 °F (427 °C) and which may require welding during fabrication, 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 purchase order.

2.1 SAE Publications:

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

AMS 2241 Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
MAM 2241 Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2248 Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2374 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steel and Alloy Forgings

2.1 SAE Publications: (Continued)

AMS 2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS 2808 Identification, Forgings

2.2 ASTM Publications:

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

ASTM A 370 Mechanical Testing of Steel Products
ASTM E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 U.S. Government Publications:

Available from Standardization Documents Order 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:
(R)

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	0.07	0.11
Manganese	0.50	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	16.00	17.00
Nickel	4.00	5.00
Molybdenum	2.50	3.25
Nitrogen	0.07	0.13

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Melting Practice:

Steel shall be multiple melted using consumable electrode practice in the remelt cycle.

3.3 Condition:

The product shall be supplied in the following condition:

3.3.1 Bars:

3.3.1.1 Rounds: Equalized, over-tempered, and ground, turned, or polished.

3.3.1.2 Shapes: Cold drawn, equalized, over-tempered, and descaled.

3.3.1.3 Flats: Hot finished, equalized, over-tempered, and descaled.

3.3.2 Forgings: Equalized, over-tempered, and descaled.

3.3.3 Forging Stock: As ordered by the forging manufacturer.

3.4 Heat Treatment:

Bars and forgings shall be equalized by heating to 1400 °F ± 50 (760 °C ± 28), holding at heat for not less than three hours, and cooling in air to 90 °F (32 °C) or lower, and over-tempered by heating to 1100 °F ± 25 (593 °C ± 14), holding at heat for not less than three hours, and cooling in air.

3.5 Properties:

Bars and forgings shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A 370:

3.5.1 As Equalized and Over-tempered:

3.5.1.1 Hardness: Not higher than 363 HB, or equivalent, except that bars 0.625 inch (15.88 mm) and under in nominal diameter may have hardness as high as 375 HB, or equivalent (See 8.2).

3.5.2 After Solution Heat Treatment, Sub-Zero Cooling, Austenite Conditioning, Sub-Zero Cooling, and Tempering: Bars and forgings shall have the properties shown in Table 2 after being solution heat treated by heating to 1900 °F ± 25 (1038 °C ± 14), holding at heat for 1 to 3 hours, and quenching in water; cooled to -100 °F (-73 °C) or colder, holding at this temperature for not less than three hours, and warming in air to room temperature; austenite conditioned by heating to 1750 °F ± 25 (954 °C ± 14), holding at heat for 10 to 60 minutes, and quenching in water; cooled to -100 °F (-73 °C) or colder, holding at this temperature for not less than three hours, and warming in air to room temperature; and tempered by heating to 1000 °F ± 25 (538 °C ± 14), holding at heat for not less than three hours, and cooling in air.

3.5.2.1 Tensile Properties:

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	165 ksi (1138 MPa)
Yield Strength at 0.2% Offset	140 ksi (965 MPa)
Elongation in 4D	10%
Reduction of Area	20%

3.5.2.2 Hardness: Shall be 38 - 48 HRC, or equivalent, but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.5.2.1 are met (See 8.2).

3.6 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, essentially free of grain boundary carbides, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.6.1 Grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forgings, showing no evidence of re-entrant grain flow.

3.7 Tolerances:

Bars shall conform to all applicable requirements of AMS 2241 or MAM 2241.

4. QUALITY ASSURANCE PROVISIONS:

4.1 (R) 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:

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

4.3 (R) Sampling and Testing:

Shall be in accordance with the following:

4.3.1 Bars and Forging Stock: AMS 2371.

4.3.2 Forgings: AMS 2374.