AEROSPACE MATERIAL SPECIFICATION

AMS5745	REV. F

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Superseding AMS5745E

Steel, Corrosion and Heat-Resistant, Bars and Forgings
16.5Cr - 4.5Ni - 2.9Mo - 0.10N
Equalized and Over-Tempered
(Composition similar to UNS S35000)

RATIONALE

This document has been reaffirmed to comply with the SAE five-year review policy.

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5745F

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2241	Tolerances, Corrosion and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2248	Chemical Check Analysis Limits, 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
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, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

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

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 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 applicable 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:

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

3.5.1 Bars and Forgings:

3.5.1.1 As Equalized and Over-Tempered:

3.5.1.1.1 Hardness: Shall be not higher than 363 HB, or equivalent (See 8.2), 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).

3.5.1.2 Response to Heat Treatment: 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.

3.5.1.2.1 Tensile Properties: Shall be as shown in Table 2:

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%

3.5.1.2.2 Hardness: Shall be 37 to 48 HRC, or equivalent (See 8.2). Product shall not be rejected on the basis of hardness if the tensile properties of 3.5.1.2.1 are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.

3.5.2 Forging Stock: When a sample of stock is forged to a test coupon and heat treated as in 3.4 and 3.5.1.2, specimens taken from the heat treated coupon shall conform to the requirements of 3.5.1.2.1 and 3.5.1.2.2. If specimens taken from the stock after heat treatment as in 3.4 and 3.5.1.2 conform to the requirements of 3.5.1.2.1 and 3.5.1.2.2, the tests shall be accepted as equivalent to tests of a forged coupon.

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.

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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: The following requirements are acceptance tests and shall be performed on each heat or lot as applicable:

4.2.1.1 Composition (3.1) of each heat.

4.2.1.2 Hardness (3.5.1.1.1) of each lot of bars and forgings as equalized and over-tempered.

4.2.1.3 Tensile properties (3.5.1.2.1) and hardness (3.5.1.2.2) of each lot of bars and forgings after solution heat treatment, sub-zero cooling, austenite conditioning, sub-zero cooling, and tempering.

4.2.1.4 Tolerances (3.7) of bars.

4.2.2 Periodic Tests: Tests of forging stock (3.5.2) to demonstrate ability to develop required properties and grain flow of die forgings (3.6.1) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 Bars, and Forging Stock: In accordance with AMS 2371.

4.3.2 Forgings: In accordance with AMS 2374.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for composition of each heat and for hardness of each lot as received and tensile properties and hardness of each lot after solution heat treatment, sub-zero cooling, austenite conditioning, sub-zero cooling, and tempering, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 5745F, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.