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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 5656B

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Superseding AMS 5656A

STEEL, CORROSION RESISTANT, BARS, WIRE, FORGINGS, EXTRUSIONS, AND RINGS
9.0Mn - 20Cr - 6.5Ni - 0.27N
Solution Heat Treated

UNS S21904

1. SCOPE:

1.1 Form:

This specification covers a corrosion-resistant steel in the form of bars, wire, forgings, extrusions, flash welded rings, and stock for forging, extruding, or flash welded rings.

1.2 Application:

These products have been used typically for parts requiring high strength and corrosion resistance from -425 to 1100 °F (-254 to 593 °C) and where parts 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 the 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

Printed in U.S.A.
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2.1 SAE Publications (Continued):

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 2750 Pyrometry
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
AMS 7490 Rings, Flash Welded, Corrosion and Heat Resistant Austenitic Steels and Austenitic-Type Alloys or Precipitation-Hardenable Alloys

2.2 ASTM Publications:

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

ASTM A 262 Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steel
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	--	0.04
Manganese	8.00	10.00
Silicon	--	1.00
Phosphorus	--	0.060
Sulfur	--	0.030
Chromium	19.00	21.50
Nickel	5.50	7.50
Nitrogen	0.15	0.40
Molybdenum	--	0.75
Copper	--	0.75

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

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 (R) Bars: Hot rolled, solution heat treated free from continuous carbide network and descaled.

3.2.1.1 Round bars shall be ground or turned.

3.2.2 (R) Wire: Cold finished and solution heat treated free from continuous carbide network.

3.2.3 (R) Forgings, Extrusions, and Flash Welded Rings: Solution heat treated free from continuous carbide network and descaled.

3.2.3.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, rings shall be manufactured in accordance with AMS 7490.

3.2.4 Stock for Forging, Flash Welded Rings, or Extrusions: As ordered by the forging, flash welded ring, or extrusion manufacturer.

3.3 (R) Heat Treatment:

Bars, wire, forgings, extrusions, and flash welded rings shall be solution heat treated by heating to 1950 °F ± 25 (1066 °C ± 14), holding at heat for a time commensurate with section thickness, and cooling at a rate equivalent to a forced air cool or faster. Pyrometry shall be in accordance with AMS 2750.

3.4 Properties:

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

3.4.1 Bars, Wire, Forgings, Extrusions, and Flash Welded Rings:

3.4.1.1 Tensile Properties: Shall be as shown in Table 2:
(R)

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	90.0 ksi (621 MPa)
Yield Strength at 0.2% Offset	50.0 ksi (345 MPa)
Elongation in 4D	40%
Reduction in area	60%

3.4.1.2 Hardness: Shall be not higher than 100 HRB, or equivalent.

3.4.1.3 Susceptibility to Intergranular Attack: A specimen of the product shall
(R) be sensitized by heating in air to 1250 °F ± 10 (677 °C ± 6), holding at heat for 60 minutes ± 5, and cooling in air. The specimen shall not show any evidence of intergranular attack when immersed in acidified copper sulfate solution in accordance with ASTM A 262, Practice E, except that the exposure time shall be 72 hours and the metallic copper shall not be used. The specimen, after immersion, shall withstand, without cracking, bending in accordance with ASTM E 262, Practice E.

3.4.2 Stock for Forging, Extruding, or Flash Welded Rings: Shall have properties as agreed upon by purchaser and vendor.

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.

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

3.6 Tolerances:

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

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:

4.2.1 Acceptance Tests: Tests for the following requirements are acceptance
(R) tests and shall be performed on each heat or lot as acceptable.

4.2.1.1 Composition (3.1) of each heat.
(R)

4.2.1.2 Tensile properties (3.4.1.1) and hardness (3.4.1.2) of each lot of bars,
(R) wire, forgings, extrusions and flash welded rings.

4.2.1.3 Tolerances (3.6) of bars and wire.

4.2.2 Periodic Tests: Tests for susceptibility to intergranular corrosion
(R) (3.4.1.3) 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:
(R)

Shall be in accordance with the following:

4.3.1 Bars, Wire, Extrusions, Flash Welded Rings, and Stock for Forging, Extruding, or Flash Welded Rings: AMS 2371.

4.3.2 Forgings: AMS 2374.

4.4 Reports:
(R)

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile and hardness of each lot and, when performed, to the periodic test requirements. This report shall include the purchase order number, lot number, AMS 5656B, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.5 Resampling and Retesting:

Shall be in accordance with the following: