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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5656D

Issued NOV 1968
Revised APR 2001
Reaffirmed APR 2006

Superseding AMS 5656C

Steel, Corrosion Resistant, Bars, Wire, Forgings, Extrusions, and Rings
9.0Mn - 20Cr - 6.5Ni - 0.27N
Solution Heat Treated

(Composition similar to 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 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.

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, Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 (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 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, Austenitic-Type Iron, Nickel, or Cobalt Alloys, or Precipitation-Hardenable Alloys

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 262 Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
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	--	0.04
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 applicable requirements of AMS 2248.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Bars: Hot rolled, solution heat treated, and descaled.

3.2.1.1 Round bars shall be ground or turned.

3.2.2 Wire: Cold finished, and solution heat treated.

3.2.3 Forgings, Extrusions, and Flash Welded Rings: Solution heat treated, 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 Properties:

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

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

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

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	90 ksi (621 MPa)
Yield Strength at 0.2% Offset	50 ksi (345 MPa)
Elongation in 4D	40%
Reduction in area	60%

3.3.1.2 Hardness: Shall be not higher than 100 HRB, or equivalent (See 8.2).

3.3.1.3 Susceptibility to Intergranular Attack: A specimen of the product shall 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 A 262, Practice E.

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

3.4 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.

3.4.1 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 reentrant grain flow.

3.5 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:

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 Tensile properties (3.3.1.1) and hardness (3.3.1.2) of each lot of bars, wire, forgings, extrusions, and flash welded rings.

4.2.1.3 Tolerances (3.5) of bars and wire.

4.2.2 Periodic Tests: Susceptibility to intergranular attack (3.3.1.3) and grain flow of die forgings (3.4.1) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.