AEROSPACE MATERIAL SPECIFICATION

AMS5656™	REV. G

Issued 1968-12
Reaffirmed 2006-04
Revised 2022-07

Superseding AMS5656F

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

(Composition similar to UNS S21904)

RATIONALE

AMS5656G is the result of a Five-Year review and update of the specification. The revision prohibits unauthorized exceptions (3.6, 4.4.3, 5.2.1.1, 8.5), updates the title to match the scope, adds AS1182 guidance (3.4.1, 8.6), updates composition tests (3.1), updates finish (3.2.1), adds strain rate control (3.3.1.1.1), prohibits bars being cut from plates (3.4.3, 4.4.4), and allows prior revisions (8.4).

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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2241 Tolerances, Corrosion- and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

AMS2248 Chemical Check Analysis Limits, Corrosion- and Heat-Resistant Steels and Alloys, Maraging and Other Highly Alloyed Steels, and Iron Alloys

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5656G/

AMS2371 Quality Assurance Sampling and Testing, Corrosion- and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2374 Quality Assurance Sampling and Testing, Corrosion- and Heat-Resistant Steel and Alloy Forgings

AMS2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion- and Heat-Resistant Steels and Alloys

AMS2808 Identification, Forgings

AMS7490 Rings, Flash Welded, Corrosion- and Heat-Resistant Austenitic Steels, Austenitic-Type Iron, Nickel, or Cobalt Alloys, or Precipitation-Hardenable Alloys

AS1182 Standard Stock Removal Allowance, Aircraft-Quality and Premium Aircraft-Quality Steel Bars and Mechanical Tubing

AS7766 Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A262 Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

ASTM A370 Mechanical Testing of Steel Products

ASTM A751 Chemical Analysis of Steel Products

ASTM E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751 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 AMS2248.

3.2 Condition

3.2.1 Bars

Solution heat treated and descaled, to hot finished or cold finished tolerances (see 3.5).

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 AMS7490.

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 A370:

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%

3.3.1.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (0.002 mm/mm/min) through 0.2% offset yield strain. The strain rate after yield may be increased to any value up to 0.5 in/in/min (or 0.5 mm/mm/min) or equivalent crosshead speed as a function of gage length. The requirement for compliance becomes effective for material produced 1 year after the publication date of this document.

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 °F (677 °C ± 6 °C), holding at heat for 60 minutes ± 5 minutes, 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 A262, 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 A262, Practice E.

3.3.2 Stock for Forging, Extruding, or Flash Welded Rings

Shall have properties as agreed upon by purchaser and producer.

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 Bars ordered hot rolled or cold drawn or ground, turned, or polished shall, after the removal of the standard machining allowance in accordance with AS1182, be free from seams, laps, tears, and cracks open to the ground, turned, or polished surface.

3.4.2 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.

3.4.3 Bars shall not be cut from plate (see 4.4.4).

3.5 Tolerances

Bars and wire shall conform to all applicable requirements of AMS2241.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.3

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer'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 (3.4.2) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.