AEROSPACE MATERIAL SPECIFICATION

AMS5629™	REV. J

Issued 1968-11
Reaffirmed 2006-10
Revised 2021-04

Superseding AMS5629H

Steel, Corrosion-Resistant, Bars, Wire, Forgings, Rings, and Extrusions
13Cr - 8.0Ni - 2.2Mo - 1.1Al
Vacuum Induction Plus Consumable Electrode Melted
Solution Heat Treated, Precipitation Hardenable
(Composition similar to UNS S13800)

RATIONALE

AMS5629J prohibits unauthorized exceptions (3.9, 4.4.4, 5.2.1.1), revises composition (3.1) to replace obsolete chemical analysis standards, updates bar condition (3.3.1), updates heat treatment (3.4) adds strain rate control (3.5.2.2.1.1), adds machining allowance (3.6.2, 8.7), and results from a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a premium aircraft-quality corrosion-resistant steel in the form of bars, wire, forgings, flash welded rings, and extrusions up to 12 inches (305 mm) in nominal diameter, or least distance between parallel sides in the solution heat treated condition (see 8.4), and stock of any size for forging, flash welded rings, or extrusion (see 8.8).

1.1.1 For purchase of solution treated and aged product, use the applicable AMS slash specification (see 8.4). If a slash sheet description is not specified, solution annealed material shall be supplied. A specific example of a slash specification is:

AMS5629/H1000 – Precipitation Hardened to H1000 condition

1.2 Application

These products have been used typically for parts requiring corrosion resistance, stress-corrosion resistance, high strength up to 600 °F (316 °C), and good ductility and strength in the transverse direction in large section sizes, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP1110 recommends practices to minimize such conditions.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724 776 4970 (outside USA)

SAE WEB ADDRESS:

For more information on this standard, visit
ds/content/AMS5629J

1.3 Classification

Product covered by this specification is classified as follows:

1.3.1 Melting Practice

Type 1 - Steel multiple melted using vacuum consumable electrode remelting.

Type 2 - Steel multiple melted using electroslag remelting.

1.3.1.1 When a type is not specified, Type 1 shall be supplied.

1.3.2 Maximum Delta Ferrite Content

Class A – 0.5% max., free ferrite.

Class B – 1.0% max., free ferrite.

Class C – 2.0% max., free ferrite.

1.3.2.1 When no class is specified, any class may be supplied.

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

AMS2300 Steel Cleanliness, Premium Aircraft-Quality Magnetic Particle Inspection Procedure

AMS2315 Determination of Delta Ferrite Content

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

AMS2750 Pyrometry

AMS2761 Heat Treatment of Steel Raw Materials

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

ARP1110 Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

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

AS6279 Industry Standard Practices for Production, Distribution, and Procurement of Metal Stock

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 A370 Mechanical Testing of Steel Products

ASTM A604 Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets

ASTM A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

ASTM E112 Determining Average Grain Size

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

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	--	0.05
Manganese	--	0.10
Silicon	--	0.10
Phosphorus	--	0.010
Sulfur	--	0.008
Chromium	12.25	13.25
Nickel	7.50	8.50
Molybdenum	2.00	2.50
Aluminum	0.90	1.35
Nitrogen	--	0.010

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248 except that no variation over maximum is permitted for nitrogen.

3.2 Melting Practice

Product shall be multiple melted using vacuum induction primary melting followed by either vacuum consumable electrode remelting for Type 1 or, when specified, electroslag remelting for Type 2.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Bars and Wire

Solution heat treated and descaled, to hot finished or cold finished tolerances (see 3.7).

3.3.1.1.1 Bar shall not be cut from plate (also see 4.4.5).

3.3.2 Forgings and Flash Welded Rings

Solution heat treated and descaled.

3.3.2.1 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.

3.3.3 Extrusions

Solution heat treated, straightened, and descaled.

3.3.4 Stock for Forging, Flash Welded Rings, or Extrusion

As ordered by the forging, flash welded ring, or extrusion manufacturer.

3.4 Heat Treatment

Bars, wire, forgings, flash welded rings, and extrusions shall be solution heat treated in accordance with AMS2761, by heating to 1700 °F ± 25 °F (927 °C ± 14 °C), holding at heat for a time commensurate with section thickness, heating equipment, and procedure used, and cooling to below 60 °F (16 °C).

3.5 Properties

Product, 12.0 inches (305 mm) and under in nominal diameter or least distance between parallel sides, shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A370.

3.5.1 All Products

3.5.1.1 Macrostructure

Visual examination of transverse full cross-sections from bars, billets, extrusions, and stock for forging, flash welded rings, or extrusions, etched in hot hydrochloric acid in accordance with ASTM A604, shall show no pipe or cracks. Porosity, segregation, inclusions, and other imperfections for product 81 square inches (523 cm^2) and under in nominal cross-sectional area shall be no worse than the macrographs of ASTM A604 shown in Table 2. For product greater than 81 square inches (523 cm^2) in cross sectional area, the macrostructure shall meet the requirements for product under 81 square inches (523 cm^2) and under in nominal cross-sectional area or the criteria shall be approved by the cognizant engineering authority.

Table 2 - Macrostructure limits

Class	Condition	Severity
1	Freckles	A
2	White Spots	A
3	Radial Segregation	A
4	Ring Pattern	B