Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 5764

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Revised

STEEL BARS, FORGINGS, EXTRUSIONS, AND RINGS, CORROSION RESISTANT
22Cr - 12.5Ni - 5.0Mn - 2.25Mo

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, flash welded rings, or extrusing.

1.2 Application: Primarily for parts requiring excellent corrosion resistance and high strength at temperatures from -423 F to +1100 F (-253 C to +593 C). Can also be used for welded parts without subsequent heat treatment.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specification (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2241 - Tolerances, Corrosion and Heat Resistant Steel Bars and Wire and Titanium and Titanium Alloy Bars and Wire
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steel and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings
AMS 2375 - Approval and Control of Critical Forgings
AMS 2808 - Identification, Forgings
AMS 7490 - Rings, Flash Welded, Corrosion and Heat Resistant Austenitic Steels and Austenitic - Type Alloys

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM A370 - Mechanical Testing of Steel Products
ASTM A393 - Conducting Acidified Copper Sulfate Test for Intergranular Attack in Austenitic Stainless Steel
ASTM E353 - Chemical Analysis of Stainless, Heat Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Ave., Philadelphia, Pennsylvania 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods.

	min	max
Carbon	--	0.06
Manganese	4.00	6.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	20.50	23.50
Nickel	11.50	13.50
Molybdenum	1.50	3.00
Columbium	0.10	0.30
Nitrogen	0.20	0.40
Vanadium	0.10	0.30
Titanium (3.1.1)	--	0.02
Aluminum (3.1.1)	--	0.02
Zirconium (3.1.1)	--	0.02

3.1.1 Determination not required for routine acceptance.

3.1.2 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 Bars:

3.2.1.1 Rounds: Centerless ground or turned after annealing.

3.2.1.2 Hexagons: Cold drawn after annealing and descaling.

3.2.1.3 Squares and Flats: Hot finished, annealed and descaled.

3.2.2 Wire: Cold drawn or centerless ground after annealing.

3.2.3 Forgings and Flash Welded Rings: Annealed and descaled.

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

3.2.4 Extrusions: Annealed, straightened, and descaled.

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

3.3 Heat Treatment: The product shall be annealed by heating to 1950 F ± 25 (1065.6 C ± 14), holding at heat for a time commensurate with section thickness, and cooling at a rate equal to air cool or faster.

3.4 Properties: The product shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A370:

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

3.4.1.1 Tensile Properties: Shall be as follows:

Tensile Strength, min	100,000 psi (690 MN/m^2)
Yield Strength at 0.2% Offset, min	55,000 psi (379 MN/m^2)
Elongation in 2 in. (50.8 mm) or 4D, min	35%
Reduction of Area (round specimens) min	55%

3.4.1.2 Hardness: Should be not lower than 20 HRC or equivalent but the product shall not be rejected on the basis of hardness if the tensile properties are met.

3.4.1.3 Embrittlement: The product, after sensitizing treatment, shall be capable of being exposed to acidified copper sulfate in accordance with ASTM A393 without evidence of intergranular surface attack. After exposure, the specimens shall not crack when bent 180 deg (3.14 rad) around a diameter equal to the nominal thickness or diameter of the specimen.

3.4.2 Stock for Forging, Flash Welded Rings, or Extruding: When a sample of stock is forged to a test coupon and heat treated as in 3.3, specimen taken from the heat treated coupon shall conform to the requirements of 3.4.1.1 and 3.4.1.2. If specimens taken from the stock after heat treatment as in 3.3 conform to the requirements of 3.4.1.1 and 3.4.1.2, the tests shall be accepted as equivalent to tests of the forged coupon.

3.5 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, wire, bars and tubing will be acceptable in mill lengths of 6 - 20 ft (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.7 Tolerances: Unless otherwise specified, tolerances for bars and wire shall conform to all applicable requirements of AMS 2241. Tolerances for extrusions shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of the specification.

4.2 Classification of Tests:

4.2.1 Routine Control Tests: Tests of the product to determine conformance to composition (3.1) requirements and of bars, wire, forgings, flash welded rings, and extrusions to determine conformance to tensile property (3.4.1.1), hardness (3.4.1.2), and tolerance (3.7) requirements are classified as routine control tests.

4.2.2 Periodic Control Tests: Tests of bars, wire, forgings, flash welded rings, and extrusions to determine conformance to embrittlement (3.4.1.3) requirements and of stock for forging, flash welded rings, or extruding to demonstrate capability of developing required properties (3.4.2) are classified as qualification and/or periodic control tests.

4.3 Sampling: Sampling of bars, wire, flash welded rings, and extrusions shall be in accordance with AMS 2371. Sampling of forgings, and stock for forging, flash welded rings, and extruding shall be as agreed upon by purchaser and vendor.

4.4 Approval: When specified, approval and control of critical forgings shall be in accordance with AMS 2375.

4.5 Reports:

4.5.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and for tensile properties and hardness of each size from each heat. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat. If forgings are supplied, the part number and the size and source of stock used to make the forgings shall also be included.

4.5.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Bars and Wire:

5.1.1.1 Each straight bar 0.500 in. (12.700 mm) and over in diameter or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with AMS 5764, heat number, and manufacturer's identification. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1.2 Straight bars and wire less than 0.500 in. (12.700 mm) in diameter or least width of flat surface shall be securely bundled and identified by a metal or plastic tag embossed with the purchase order number, AMS 5764, heat number, nominal size, and manufacturer's identification and attached to each bundle or shall be boxed and the box marked with the same information.

5.1.1.3 Coiled bars and wire shall be securely bundled and identified by a metal or plastic tag embossed with the purchase order number, AMS 5764, heat number, nominal size, and manufacturer's identification and attached to each coil or shall be boxed and the box marked with the same information.

5.1.2 Forgings: In accordance with AMS 2808.

5.1.3 Flash Welded Rings, Extrusions, and Stock for Forging, Flash Welded Rings, and Extruding: As agreed upon by purchaser and vendor.

5.2 Packaging: The product shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.