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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-5654REV
D

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Superseding AMS-5654C

Submitted for recognition as an American National Standard

STEEL BARS, WIRE, FORGINGS, TUBING, AND RINGS, CORROSION AND HEAT RESISTANT
18Cr - 11Ni - 0.60(Cb + Ta) (SAE 30347)
Consumable Electrode Melted
Solution Heat Treated

UNS S34700

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant steel in the form of bars, wire, forgings, mechanical tubing, flash welded rings, and stock for forging or flash welded rings.

1.2 Application: Primarily for parts requiring corrosion and heat resistance and subject to very rigid inspection standards, especially when such parts are welded during fabrication; for parts requiring oxidation resistance up to 1500°F (816°C) but useful at that temperature only when stresses are low.

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.

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SAE AMS-5654 Revision D**2.1.1 Aerospace Material Specifications:**

- 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-2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing
- MAM-2243 - Tolerances, Metric, Corrosion and Heat Resistant Steel Tubing
- AMS-2248 - Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
- AMS-2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock
- AMS-2374 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Forgings and Forging Stock
- 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

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 Steels
- ASTM A 370 - Mechanical Testing of Steel Products
- ASTM E 45 - Determining the Inclusion Content of Steel
- 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 Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.**2.3.1 Military Standards:**

- MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

SAE AMS-5654 Revision D**3. TECHNICAL REQUIREMENTS:**

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.020
Sulfur	--	0.020
Chromium	17.00 - 19.00	
Nickel	9.00 - 13.00	
Columbium + Tantalum	10xC - 1.10	
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 Bars, Wire, Forgings, Mechanical Tubing, and Flash Welded Rings: Solution heat treated free from continuous carbide network.

- 3.2.1.1 Bars and Wire:

- 3.2.1.1.1 All hexagons, other bars 2.75 inches (69.8 mm) and under in nominal diameter or distance between parallel sides, and wire shall be cold finished.

- 3.2.1.1.2 Bars, other than hexagons, over 2.75 inches (69.8 mm) in nominal diameter or distance between parallel sides shall be hot finished.

- 3.2.1.2 Mechanical Tubing: Shall be cold finished.

- 3.2.1.3 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.

- 3.2.2 Stock for Forging or Flash Welded Rings: As ordered by the forging or flash welded ring manufacturer.

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

- 3.3.1 Tensile Properties: Wire shall have tensile strength not higher than 125,000 psi (862 MPa).

SAE AMS-5654 Revision D**3.3.2 Hardness:**

- 3.3.2.1 Bars: Shall be as follows, or equivalent, determined at approximate mid-radius or quarter-thickness:

Nominal Diameter or Distance Between Parallel Sides		Brinell Hardness	
Inches	Millimetres	min	max
Up to 2.000, incl	Up to 50.80, incl	140	255
Over 2.000	Over 50.80	--	241

- 3.3.2.2 Mechanical Tubing: Shall be not higher than 90 HRB, or equivalent, determined approximately midway between outer and inner surfaces.
- 3.3.2.3 Forgings and Flash Welded Rings: Shall be not higher than 187 HB, or equivalent.
- 3.3.3 Susceptibility to Intergranular Attack: The product, after sensitizing treatment, shall pass the intergranular corrosion test performed in accordance with ASTM A 262, Practice E.
- 3.3.4 Micro-Inclusion Rating: Two-thirds of the total number of specimens as well as the average of all specimens shall not exceed the following limits, determined in accordance with ASTM E 45, Method D, on specimens as in 4.3.3, except that the length of any inclusion shall be not greater than 0.015 inch (0.38 mm).

Type	A	B	C	D
Thin	2.0	1.5	1.5	1.5
Heavy	1.0	1.0	1.0	1.5

3.4 Quality:

- 3.4.1 Steel shall be multiple melted using consumable electrode practice in the remelt cycle.
- 3.4.2 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.
- 3.4.3 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 re-entrant grain flow.
- 3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars, wire, and tubing will be acceptable in mill lengths of 6 - 20 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

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3.6 Tolerances: Shall conform to all applicable requirements of the following:

3.6.1 Bars and Wire: AMS-2241 or MAM-2241.

3.6.2 Mechanical Tubing: AMS-2243 or MAM-2243.

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 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 tests and shall be performed on each heat or lot as applicable:

4.2.1.1 Composition (3.1) and micro-inclusion rating (3.3.4) of each heat.

4.2.1.2 Tensile properties (3.3.1) of each lot of wire.

4.2.1.3 Hardness (3.3.2) of each lot of bars, mechanical tubing, forgings, and flash welded rings.

4.2.1.4 Tolerances (3.6) of bars, wire, and mechanical tubing.

4.2.2 Periodic Tests: Tests for susceptibility to intergranular attack (3.3.3) 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: Shall be in accordance with the following:

4.3.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Flash Welded Rings: AMS-2371.

4.3.2 Forgings and Forging Stock: AMS-2374.

4.3.3 Samples for micro-inclusion rating (3.3.4) shall consist of not less than six specimens obtained from the full cross-section of billet stock representing the top and bottom of at least the first, middle, and last usable ingot from each heat.