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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5654E

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Submitted for recognition as an American National Standard

Superseding AMS 5654D

Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 18Cr - 11Ni - 0.60(Cb + Ta) (SAE 30347) Premium Aircraft Quality, 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:

These products have been used typically 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, 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 form 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.

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 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 2243	Tolerances, Corrosion and Heat Resistant Steel Tubing
MAM 2243	Tolerances, Metric, Corrosion and Heat Resistant Steel Tubing
AMS 2248	Chemical Check Analysis Limits, Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
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 19248-2959.

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

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	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.020
Sulfur	--	0.020
Chromium	17.00	19.00
Nickel	9.00	13.00
Columbium	10xC	1.10
Tantalum	--	0.05
Molybdenum	--	0.75
Copper	--	0.75

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Melting Practice:

Product shall be multiple melted using consumable electrode practice in the remelt cycle.

3.3 Condition:

The product shall be supplied in the following condition:

3.3.1 Bars, Wire, Forgings, Mechanical Tubing, and Flash Welded Rings: Solution heat treated.

3.3.1.1 Bars and Wire:

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

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

3.3.1.2 Mechanical Tubing: Shall be cold finished.

3.3.1.3 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.

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

3.4 Properties:

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

3.4.1 Tensile Properties: Wire shall have tensile strength not higher than 125 ksi (862 MPa).

3.4.2 Hardness:

3.4.2.1 Bars: Shall be as shown in Table 2, or equivalent (See 8.2), determined at approximately mid-radius.

TABLE 2 - Hardness Requirements

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

3.4.2.2 Mechanical Tubing: Shall be not higher than 90 HRB, or equivalent (See 8.2), determined approximately midway between outer and inner surfaces.

3.4.2.3 Forgings and Flash Welded Rings: Shall be not higher than 187 HB, or equivalent (See 8.2).

3.4.3 Susceptibility to Intergranular Attack: The product, after sensitizing treatment, shall pass the intergranular corrosion test performed in accordance with ASTM A 262, Practice E.

3.4.4 Micro-Inclusion Rating: No specimen shall exceed the limits shown in Table 3, determined in accordance with ASTM E 45, Method D, except that the length of any inclusion shall be not greater than 0.015 inch (0.38 mm).

TABLE 3 - Micro-Inclusion Rating Limits

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

3.5 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.

3.5.1 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 re-entrant grain flow.

3.6 Tolerances:

Shall be as follows:

3.6.1 Bars and Wire: In accordance with AMS 2241 or MAM 2241.

3.6.2 Mechanical Tubing: In accordance with 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 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) and micro-inclusion rating (3.4.4) of each heat.

4.2.1.2 Tensile properties (3.4.1) of each lot of wire.

4.2.1.3 Hardness (3.4.2) 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: Susceptibility to intergranular attack (3.3.3), and grain flow of die forgings (3.5.1) 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 as follows:

4.3.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Forging or Flash Welded Rings: In accordance with AMS 2371.

4.3.2 Forgings: In accordance with AMS 2374.