SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5653F

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Reaffirmed APR 2007

Superseding AMS 5653E

Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings
17Cr - 12Ni - 2.5Mo (0.030 Max C)
Solution Heat Treated

(Composition similar to UNS S31603)

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

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 both corrosion and heat resistance up to 1600 °F (871 °C), but usage is not limited to such applications.

1.2.1 At comparable elevated temperatures, strength of this steel is slightly higher than, and oxidation resistance is similar to, that of 18-8 type steels.

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.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

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 Identification, Forgings
AMS 2808	Identification, Forgings
AMS 7490	Rings, Flash Welded, Corrosion and Heat-Resistant Austenitic Steels and Austenitic-Type Alloys, or Precipitation-Hardenable Alloys

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM A 262	Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM A 370	Mechanical Testing of Steel Products
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	- -	0.030
Manganese	1.25	2.00
Silicon	- -	1.00
Phosphorus	- -	0.040
Sulfur	- -	0.030
Chromium	16.00	18.00
Nickel	10.00	14.00
Molybdenum	2.00	3.00
Copper	- -	1.00

3.1.1 Check Analysis: Composition variations shall meet the applicable 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.

3.2.1.1 Bars and Wire:

3.2.1.1.1 All hexagons, regardless of size, 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 after solution heat treatment.

3.2.1.1.2 Bars, other than hexagons, over 2.75 inches (69.8 mm) in nominal diameter or least distance between parallel sides shall be hot finished, solution heat treated, and descaled.

3.2.1.2 Mechanical Tubing: Shall be cold finished after solution heat treatment.

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 ksi (862 MPa).

3.3.2 Hardness:

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

TABLE 2 - Brinell Hardness

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

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

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

3.3.3 Susceptibility to Intergranular Attack: Specimens from the product shall pass, after sensitization, the intergranular corrosion test performed in accordance with ASTM A 262, Practice E.

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 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.

3.5 Tolerances:

Shall be as follows:

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

3.5.2 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: Composition (3.1), tensile properties of wire (3.3.1), hardness (3.3.2), susceptibility to intergranular attack (3.3.3), and tolerances (3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Grain flow of die forgings (3.4.1) is a periodic test 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.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the following results of tests and relevant information:

4.4.1 For each heat:

Composition.

4.4.2 For each lot of bars, wire, forgings, mechanical tubing, and flash welded rings::

If wire, tensile properties
Hardness, if other than wire
Susceptibility to intergranular attack.

4.4.3 A statement that the product conforms to the other technical requirements.