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Superseding AMS5650E	

Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings
23Cr - 13.5Ni (SAE 30309S)
Solution Heat Treated
(Composition similar to UNS S30908)

RATIONALE

AMS5650F has been reaffirmed to comply with the SAE five-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 typically used for parts requiring corrosion and heat resistance and where such parts may require welding during fabrication, and for parts requiring oxidation resistance up to 2000 °F (1093 °C), 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 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 724-776-4970 (outside USA), or www.sae.org.

AMS 2241	Tolerances, Corrosion and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2243	Tolerances, 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

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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 International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, 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	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	22.00	24.00
Nickel	12.00	15.00
Molybdenum	--	0.75
Copper	--	0.75

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, 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., except round bars shall be ground or turned.

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 not higher than 187 HB, or equivalent (See 8.2), except that, if supplied cold finished, hardness may be as high as 229 HB, or equivalent, determined approximately at mid-radius or quarter-thickness.

3.3.2.2 Forgings and Flash Welded Rings

Shall be not higher than 187 HB, or equivalent (See 8.2).

3.3.2.3 Mechanical Tubing

Shall be not higher than 90 HRB, or equivalent (See 8.2), determined approximately midway between outer and inner surface.

3.3.2.4 Susceptibility to Intergranular Attack: Specimens from the product shall pass 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.

3.5.2 Mechanical Tubing

In accordance with AMS 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 (3.3.1), hardness (3.3.2), and tolerances (3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Susceptibility to intergranular attack (3.3.2.4) and grain flow of die forgings (3.4.1) 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.

4.4 Reports

4.4.1 The vendor of bars, wire, forgings, mechanical tubing, and flash welded rings shall furnish with each shipment a report showing the results of tests for composition of each heat and for tensile properties, if wire, and hardness of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 5650F, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of stock for forging or flash welded rings shall furnish with each shipment a report showing the results of tests for chemical composition of each heat. This report shall include the purchase order number, heat number, AMS 5650F, size, and quantity.

4.5 Resampling and Retesting

Shall be as follows:

4.5.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Forging or Flash Welded Rings

In accordance with AMS 2371.