

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 5803B

Submitted for recognition as an American National Standard

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Superseding AMS 5803A

STEEL, CORROSION AND HEAT RESISTANT, WELDING WIRE
16.4Cr - 4.8Ni - 0.22(Cb + Ta) - 3.6Cu
Vacuum Melted

UNS S17400

1. SCOPE:

1.1 **Form:** This specification covers a corrosion and heat resistant steel in the form of welding wire.

1.2 **Application:** Primarily for use as filler metal for gas-tungsten-arc or gas-metal-arc welding of steels of similar composition requiring joints with strength and corrosion resistance comparable to those of the base metal.

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 latest issue in effect on the date of the purchase order.

2.1 **SAE Publications:** Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

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 2813 - Packaging of Welding Wire, Standard Method

AMS 2814 - Packaging of Welding Wire, Premium Quality

AMS 2815 - Identification, Welding Wire, Line Code System

AMS 2816 - Identification, Welding Wire, Color Code System

AMS 5643 - Steel Bars, Forgings, Tubing, and Rings, Corrosion Resistant, 16Cr - 4.0Ni - 0.30(Cb + Ta) - 4.0Cu, Solution Heat Treated

2.1.2 Aerospace Recommended Practices:

ARP1876 - Weldability Test for Weld Filler Metal Wire

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2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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 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	--	0.05	
Manganese	0.25 -	0.75	
Silicon	--	0.50	
Phosphorus	--	0.015	
Sulfur	--	0.008	
Chromium	16.00 -	16.75	
Nickel	4.50 -	5.00	
Columbium + Tantalum	0.15 -	0.30	
Copper	3.25 -	4.00	
Molybdenum	--	0.75	
Aluminum	--	0.05	
Boron	--	0.001	(10 ppm)
Tin	--	0.0050	(50 ppm)
Lead	--	0.001	(10 ppm)
Oxygen	--	0.0050	(50 ppm)
Nitrogen	--	0.0150	(150 ppm)
Hydrogen	--	0.0005	(5 ppm)

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248. No variation over maximum is permitted for boron, tin, lead, oxygen, nitrogen, and hydrogen.

3.2 Condition: Cold finished, bright finish in a temper and with a surface finish which will provide proper feeding of the wire in machine welding equipment.

3.2.1 Wire shall be furnished on disposable spools for machine welding or in cut lengths for manual welding, as ordered.

3.2.2 Drawing compounds, oxides, dirt, and oil shall be removed by cleaning processes which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

3.2.2.1 If pickling is necessary to remove surface contamination or scaling, only a light pickle shall be used followed by vacuum degassing.

3.3 Properties: Wire shall conform to the following requirements:

- 3.3.1 Weldability: Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds. ARP1876 may be used to resolve disputes.
- 3.3.2 Response to Heat Treatment: When specified, weld metal deposits, approximately 1/4 inch (6.4 mm) in thickness, deposited on AMS 5643 steel shall attain hardness not lower than 38 HRC, or equivalent, determined in accordance with ASTM E 18, after being solution heat treated by heating to $1900^{\circ}\text{F} \pm 25$ ($1038^{\circ}\text{C} \pm 14$), holding at heat for not less than 30 minutes, and cooling to below 60°F (16°C) and precipitation heat treated by heating to $900^{\circ}\text{F} \pm 10$ ($482^{\circ}\text{C} \pm 6$), holding at heat for 60 minutes ± 5 , and cooling in air.
- 3.3.3 Spooled Wire: Shall conform to 3.3.3.1 and 3.3.3.2.
- 3.3.3.1 Cast: Wire, wound on standard 12-inch (305-mm) diameter spools, shall have imparted to it a curvature such that a specimen sufficient in length, 4 to 14 feet (1.2 - 4.3 m), to form one loop, when cut from the spool and laid on a flat surface, shall form a circle 15 - 50 inches (381 - 1270 mm) in diameter.
- 3.3.3.2 Helix: The specimen on which cast was determined, when laid on a flat surface and measured between adjacent turns, shall show a vertical separation not greater than 1 inch (25 mm).

3.4 Quality:

- 3.4.1 Steel shall be multiple melted using consumable electrode practice in the remelt cycle or shall be vacuum induction melted.
- 3.4.2 Wire, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to welding operations, operation of welding equipment, or properties of the deposited weld metal.

3.5 Sizes and Tolerances: Wire shall be supplied in the sizes and to the tolerances shown in 3.5.1 and 3.5.2.

3.5.1 Diameter:

TABLE I

Form	Nominal Diameter, Inch	Tolerance, Inch	
		plus	minus
Cut Lengths	0.030, 0.045, 0.062, 0.078	0.002	0.002
Cut Lengths	0.094, 0.125, 0.156, 0.188	0.003	0.003
Spools	0.007, 0.010, 0.015, 0.020	0.0005	0.0005
Spools	0.030, 0.035, 0.045	0.001	0.002
Spools	0.062, 0.078, 0.094	0.002	0.002

TABLE I (SI)

Form	Nominal Diameter Millimeters	Tolerance, Millimeter	
		plus	minus
Cut Lengths	0.76, 1.14, 1.57, 1.98	0.05	0.05
Cut Lengths	2.39, 3.18, 3.96, 4.78	0.08	0.08
Spools	0.18, 0.25, 0.38, 0.51	0.013	0.013
Spools	0.76, 0.89, 1.14	0.025	0.05
Spools	1.57, 1.98, 2.39	0.05	0.05

- 3.5.2 Length: Cut lengths shall be furnished in 18, 27, or 36 inch (457, 686, or 914 mm) lengths, as ordered, and shall not vary more than +0, -0.5 inch (-13 mm) from the length ordered.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of wire 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 wire conforms to the requirements of this specification.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests for composition (3.1), response to heat treatment when specified (3.3.2), and sizes and tolerances (3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

- 4.2.2 Periodic Tests: Tests for weldability (3.3.1), cast (3.3.3.1), and helix (3.3.3.2) 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 AMS 2371 and as specified herein.

- 4.4 Reports: The vendor of wire shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and stating that the wire conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 5803B, nominal size, and quantity.

- 4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

- 5.1 Heat: Wire on each spool shall be of one continuous length from the same heat of steel.