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# AEROSPACE MATERIAL SPECIFICATION

**SAE**

AMS 5830A

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Superseding AMS 5830

Submitted for recognition as an American National Standard

NICKEL-IRON ALLOY, CORROSION AND HEAT RESISTANT, WELDING WIRE  
12.5Cr - 42.5Ni - 6.0Mo - 2.7Ti - 0.015B - 35Fe

UNS N09901

## 1. SCOPE:

### 1.1 Form:

This specification covers a corrosion and heat resistant nickel-iron alloy in the form of welding wire.

### 1.2 Application:

This wire has been used typically as filler metal for electron beam, gas-tungsten-arc, or gas-metal-arc weld buildup of alloys of similar composition, but usage is not limited to such applications.

## 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.

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 and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS 2813 Packaging and Marking of Packages of Welding Wire, Standard Method

AMS 2814 Packaging and Marking of Packages of Welding Wire, Premium Quality

AMS 2816 Identification, Welding Wire, Tab Marking Method

AMS 2819 Identification, Welding Wire, Direct Color Code System

ARP1 876 Weldability Test for Weld Filler Metal Wire

ARP4926 Alloy Verification and Chemical Composition Inspection of Welding Wire

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## 2.2 ASTM Publications:

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

ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

## 3. TECHNICAL REQUIREMENTS:

## 3.1 Wire Composition:

(R)

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 – Composition

Element	min	max
Carbon	--	0.10
Manganese	--	1.00
Silicon	--	0.60
Phosphorus	--	0.015
Sulfur	--	0.010
Chromium	11.00	14.00
Nickel	40.00	45.00
Molybdenum	5.00	7.00
Titanium	2.35	3.10
Boron	0.010	0.020
Cobalt	--	1.00
Aluminum	--	0.35
Copper	--	0.50
Lead	--	0.0005 ( 5 ppm)
Bismuth	--	0.00003 ( 0.03 ppm)
Selenium	--	0.0003 ( 3 ppm)
Calcium	--	0.0010 (10 ppm)
Oxygen	--	0.0025 (25 ppm)
Nitrogen	--	0.0050 (50 ppm)
Hydrogen	--	0.0010 (10 ppm)
Iron	remainder	

- 3.1.1 Except for hydrogen, nitrogen, and oxygen, chemical analysis of initial ingot, bar, or rod stock before drawing is acceptable provided the processes used for drawing or rolling, annealing, and cleaning are controlled to ensure continued conformance to composition requirements. Hydrogen, nitrogen, and oxygen shall be determined at finished diameter.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2248. No variation is permitted for lead, bismuth, selenium, calcium, oxygen, nitrogen, and hydrogen.

3.2 Melting Practice:

Alloy shall be produced by multiple melting using vacuum consumable electrode process in the remelt cycle or shall be vacuum induction melted.

3.3 Condition:

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

3.3.1 In process annealing between cold rolling or drawing operations shall be performed in a (R) protective atmosphere to avoid surface oxidation and absorption of other extraneous elements.

3.3.2 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.

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

3.4 Properties:

Wire shall conform to the following requirements:

3.4.1 Weldability: Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds. ARP1876 may be used to resolve disputes.

3.4.2 Spooled Wire: Shall conform to 3.4.2.1 and 3.4.2.2.

3.4.2.1 Cast: Wire, wound on standard 12-inch (305-mm) diameter spools, shall have imparted to (R) it a curvature such that a specimen sufficient in length to form one loop with a nominal 1 inch (25 mm) overlap, when cut from the spool and laid on a flat surface, shall form a circle 15 to 50 inches (381 to 1270 mm) in diameter.

3.4.2.2 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).

## 3.5 Quality:

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.

## 3.6 Sizes and Tolerances:

Wire shall be supplied in the sizes and to the tolerances shown in 3.6.1 and 3.6.2.

## 3.6.1 Diameter: Shall be as shown in Table 2.

TABLE 2A – Sizes and Diameter Tolerances, Inch/Pound Units

Form	Nominal Diameter Inch	Tolerance	Tolerance
		Inch Plus	Inch 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 2 B- Sizes and Diameter Tolerances, SI Units

Form	Nominal Diameter Millimeters	Tolerance	Tolerance
		Millimeter Plus	Millimeter 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

3.6.2 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.