

# AEROSPACE MATERIAL SPECIFICATION



AMS 5839A

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Superseding AMS 5839

## Nickel Alloy, Corrosion and Heat-Resistant, Welding Wire 59Ni - 22Cr - 2.0Mo - 14W - 0.35Al

(Composition similar to UNS N06231)

### 1. SCOPE:

#### 1.1 Form:

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

#### 1.2 Application:

This wire has been used typically as filler metal for gas-metal-arc or gas-tungsten-arc welding of parts fabricated from alloy of similar composition, 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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

#### 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2269	Chemical Check Analysis Limits, Nickel, Nickel Alloys and Cobalt 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
ARP1876	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, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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

## 3. TECHNICAL REQUIREMENTS:

## 3.1 Composition:

Wire 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	0.05	0.15
Manganese	0.30	1.00
Silicon	0.25	0.75
Phosphorus	--	0.03
Sulfur	--	0.015
Chromium	20.00	24.00
Molybdenum	1.00	3.00
Tungsten	13.00	15.00
Aluminum	0.20	0.50
Cobalt	--	3.00
Titanium	--	0.10
Boron	--	0.003
Iron	--	3.00
Copper	--	0.50
Lanthanum	--	0.05
Nickel	remainder	

3.1.1 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.

3.1.2 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2269.

## 3.2 Condition:

Cold drawn, bright finished, in a temper which will provide proper feeding of the wire in machine welding equipment.

### 3.3 Fabrication:

- 3.3.1 Wire shall be formed from rod or bar descaled by a process which does not affect the composition of the wire. Surface irregularities inherent with a forming process that do not tear the wire surfaces are acceptable provided the wire conforms to the tolerances of 3.6.
- 3.3.2 Butt welding is permissible provided both ends to be joined are alloy verified using a method capable of distinguishing the alloy from all other alloys processed in the facility, or the repair is made at the wire processing station. The butt weld shall not interfere with uniform, uninterrupted feeding of the wire in machine welding.
- 3.3.3 In-process annealing, if required, between cold rolling or drawing operations, shall be performed in vacuum or protective atmospheres to ensure freedom from surface oxidation and absorption of other extraneous elements.
- 3.3.4 Residual elements, drawing compounds, oxides, dirt, oil, dissolved gasses, and other foreign materials picked up during wire processing that can adversely affect the welding characteristics, the operation of the equipment, or the properties of the weld metal, shall be removed by cleaning processes that will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

### 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 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, operations 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, 0.035, 0.045	0.001	0.002
Cut Lengths	0.062, 0.078, 0.094, 0.125, 0.156, 0.187	0.002	0.002
Spools	0.007, 0.010, 0.015	0.0005	0.0005
Spools	0.020, 0.030, 0.035, 0.045, 0.062	0.001	0.002
Spools	0.078, 0.094	0.002	0.002

TABLE 2B - Sizes and Diameter Tolerances, SI Units

Form	Nominal Diameter Millimeters	Tolerance	Tolerance
		Millimeter Plus	Millimeter Minus
Cut Lengths	0.76, 0.89, 1.14	0.025	0.05
Cut Lengths	1.57, 1.98, 2.39, 3.18, 3.96, 4.75	0.05	0.05
Spools	0.18, 0.25, 0.38	0.013	0.013
Spools	0.51, 0.76, 0.89, 1.14, 1.57	0.025	0.05
Spools	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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to specified requirements.