

# AEROSPACE MATERIAL SPECIFICATION



AMS 5676E

Issued JUN 1953  
Revised JUL 2000

Superseding AMS 5676D

## Nickel Alloy, Corrosion and Heat Resistant, Welding Wire 80Ni - 20Cr

UNS N06003

### 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-tungsten-arc or gas-metal-arc welding of parts, fabricated from similar or dissimilar corrosion and heat resistant alloys, requiring joints with strength and corrosion resistance comparable to those of the basis metal, 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 form 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

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## 2.1 (Continued):

ARP1876 Weldability Test for Weld Filler Metal Wire  
 ARP4926 Alloy Verification and Chemical Composition Inspection of Welding Wire

## 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	0.08	0.26
Manganese	--	1.00
Silicon	--	0.50
Phosphorus	--	0.025
Sulfur	--	0.015
Chromium	19.00	21.00
Nickel	75.00	--
Cobalt	--	1.00
Iron	--	0.50
Copper	--	0.20

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

3.1.2 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 chemical composition requirements.

## 3.2 Condition:

Cold worked, bright finish, in a temper and with a surface finish 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 does 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 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	Inch	Nominal Diameter	Tolerance	Tolerance
			Inch Plus	Inch Minus
Cut Lengths	0.030, 0.045		0.001	0.002
Cut Lengths	0.062, 0.078, 0.094, 0.125, 0.156, 0.188		0.002	0.002
Spools	0.0007, 0.010, 0.015, 0.062		0.0005	0.0005
Spools	0.020, 0.030, 0.035, 0.045		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, 1.14	0.025	0.050
Cut Lengths	1.57, 1.98, 2.39, 3.18, 3.96, 4.78	0.05	0.05
Spools	0.18, 0.25, 0.38	0.013	0.013
Spools	0.051, 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.

##### 4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), sizes and tolerances (3.6), and alloy verification (5.2.1) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests for weldability (3.4.1), cast (3.4.2.1), and helix (3.4.2.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.