

# AEROSPACE MATERIAL SPECIFICATION



AMS 5817E

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Superseding AMS 5817D

## Steel, Corrosion and Heat Resistant, Welding Wire 13Cr - 2.0Ni - 3.0W

UNS S41800

### 1. SCOPE:

#### 1.1 Form:

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

#### 1.2 Application:

This wire has been typically used as filler metal for gas-tungsten-arc or gas-metal-arc welding of corrosion-resistant steels of similar composition where the weld area is required to have strength and corrosion resistance comparable to those of the parent 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 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 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 2813 | Packaging and Marking Packages of Welding Wire, Standard Method                                                                           |
| AMS 2814 | Packaging and Marking Packages of Welding Wire, Premium Quality                                                                           |
| AMS 2816 | Identification, Welding Wire, Tab Marking Method                                                                                          |

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## 2.1 (Continued):

- AMS 2819 Identification, Welding Wire, Direct Color Code System
- AMS 5508 Steel, Corrosion and Heat Resistant, Sheet, Strip, and Plate 13Cr - 2.0Ni - 3.0W Annealed
- AMS 5616 Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 13Cr - 2.0Ni - 3.0W Annealed
- 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 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:

Wire 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     | 0.15  | 0.20  |
| Manganese  | --    | 0.50  |
| Silicon    | --    | 0.50  |
| Phosphorus | --    | 0.04  |
| Sulfur     | --    | 0.03  |
| Chromium   | 12.00 | 14.00 |
| Nickel     | 1.80  | 2.20  |
| Tungsten   | 2.50  | 3.50  |
| Molybdenum | --    | 0.50  |
| Aluminum   | --    | 0.15  |
| Copper     | --    | 0.50  |
| Tin        | --    | 0.05  |

## 3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2248.

- 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, annealed, descaled, and bright finished 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 Response to Heat Treatment: Weld metal deposits, approximately 1/4 inch (6.4 mm) thick, on AMS 5508 or AMS 5616 steel shall have hardness not lower than 45 HRC, or equivalent (See 8.2), determined in accordance with ASTM E 18, after being heated to 1800 °F ± 10 (982 °C ± 6), held at heat for 15 to 30 minutes, and cooled in air.
- 3.4.3 Spooled Wire: Shall conform to 3.4.3.1 and 3.4.3.2.

3.4.3.1 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 to form one loop within 1 inch (25 mm) overlap when cut from the spool and laid on a flat surface, shall form a circle 15 to 50 inches (281 to 1270 mm) in diameter.

3.4.3.2 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).

### 3.5 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 standard 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 Tolerances, Inch/Pound Units

| Form        | Nominal Diameter, Inch                   | Tolerance, Inch<br>Plus | Tolerance, Inch<br>Minus |
|-------------|------------------------------------------|-------------------------|--------------------------|
| Cut Lengths | 0.030, 0.035, 0.045                      | 0.001                   | 0.001                    |
| 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               | 0.001                   | 0.001                    |
| Spools      | 0.062, 0.078, 0.094                      | 0.002                   | 0.002                    |

TABLE 2B - Sizes and Tolerances, SI Units

| Form        | Nominal Diameter<br>Millimeters    | Tolerance, Millimeter<br>Plus | Tolerance, Millimeter<br>Minus |
|-------------|------------------------------------|-------------------------------|--------------------------------|
| Cut Lengths | 0.76, 0.89, 1.14                   | 0.025                         | 0.025                          |
| 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             | 0.025                         | 0.025                          |
| Spools      | 1.57, 1.98, 2.39                   | 0.05                          | 0.05                           |