



# AEROSPACE MATERIAL SPECIFICATION

**AMS5803™****REV. G**

|            |         |
|------------|---------|
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| Noncurrent | 2002-12 |
| Revised    | 2015-12 |

Superseding AMS5803F

Steel, Corrosion and Heat-Resistant, Welding Wire  
16.4Cr - 4.8Ni - 0.22Cb (Nb) - 3.6Cu  
Consumable Electrode or Vacuum Induction Melted  
(Composition similar to UNS S17480)

## RATIONALE

AMS5803G revises Fabrication (3.4.2) and Length (3.7.2), and is a Five Year Review and update of this specification.

### 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 used typically 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, but usage is not limited to such application.

### 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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

#### 2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

|         |                                                                                                                                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------|
| AMS2248 | Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys |
| AMS2371 | Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock                |
| AMS2813 | Packaging and Marking of Packages of Welding Wire, Standard Method                                                                        |

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|         |                                                                                                                                                     |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| AMS2814 | Packaging and Marking of Packages of Welding Wire, Premium Quality                                                                                  |
| AMS2816 | Identification Welding Wire, Tab Marking Method                                                                                                     |
| AMS2819 | Identification, Welding Wire Direct Color Code System                                                                                               |
| AMS5643 | Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 16Cr - 4.0Ni - 0.30Cb - 4.0Cu, Solution Heat Treated, Precipitation Hardenable |
| 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 International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

|           |                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------|
| ASTM E18  | Rockwell Hardness of Metallic Materials                                                                 |
| ASTM E353 | Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys |

## 3. TECHNICAL REQUIREMENTS

### 3.1 Wire Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

**Table 1 - Composition**

| Element             | 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 (Niobium) | 0.15  | 0.30   |           |
| Copper              | 3.25  | 4.00   |           |
| Molybdenum          | --    | 0.75   |           |
| Aluminum            | --    | 0.05   |           |
| Boron (3.1.2)       | --    | 0.0010 | ( 10 ppm) |
| Tin (3.1.2)         | --    | 0.0050 | ( 50 ppm) |
| Lead (3.1.2)        | --    | 0.0010 | ( 10 ppm) |
| Oxygen (3.1.2)      | --    | 0.0050 | ( 50 ppm) |
| Nitrogen (3.1.2)    | --    | 0.0150 | (150 ppm) |
| Hydrogen (3.1.2)    | --    | 0.0005 | ( 5 ppm)  |

3.1.1 Chemical analysis of initial 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 AMS2248. No variation over maximum is permitted for boron, tin, lead, oxygen, nitrogen, and hydrogen.

### 3.2 Melting Practice

Steel shall be multiple melted using consumable electrode practice in the remelt cycle or shall be vacuum induction melted.

### 3.3 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.

3.3.1 All wire shall have a smooth finish that is free from slivers, depressions, scratches, scale, seams, laps, and foreign matter that would adversely affect welding characteristics, operation of the welding equipment, or properties of the weld metal.

### 3.4 Fabrication

3.4.1 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 3.7.

3.4.2 Butt welding is permissible only at diameters larger than final finished product size 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.

3.4.3 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.

3.4.4 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.

### 3.5 Properties

Wire shall conform to the following requirements:

#### 3.5.1 Weldability

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

#### 3.5.2 Response to Heat Treatment

When specified, weld metal, approximately ¼ inch (6.4 mm) in thickness, deposited on AMS5643 steel, shall attain hardness not lower than 38 HRC, or equivalent (see 8.2), determined in accordance with ASTM E18, after being solution heat treated by heating to 1,900 °F ± 25 °F (1,038 °C ± 14 °C), 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 °F ± 10 °F (482 °C ± 6 °C), holding at heat for 60 minutes ± 5 minutes, and cooling at a rate equivalent to cooling in air.

### 3.5.3 Spooled Wire

Shall conform to 3.5.3.1 and 3.5.3.2.

#### 3.5.3.1 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 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.

#### 3.5.3.2 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).

### 3.6 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.

### 3.7 Sizes and Tolerances

Wire shall be supplied in the sizes and to the tolerances shown in 3.7.1 and 3.7.2.

#### 3.7.1 Diameter

Shall be as shown in Table 2.

**Table 2A - Sizes and diameter tolerances, inch/pound units**

| Form        | Nominal Diameter Inch                    | Tolerance Inch<br>Plus and Minus |
|-------------|------------------------------------------|----------------------------------|
| Cut Lengths | 0.030, 0.035, 0.045                      | 0.001                            |
| Cut Lengths | 0.062, 0.078, 0.094, 0.125, 0.156, 0.187 | 0.002                            |
| Spools      | 0.007, 0.010, 0.015                      | 0.0005                           |
| Spools      | 0.020, 0.030, 0.035, 0.045               | 0.001                            |
| Spools      | 0.062, 0.078, 0.094                      | 0.002                            |

**Table 2B - Sizes and diameter tolerances, SI units**

| Form        | Nominal Diameter Millimeters       | Tolerance<br>Millimeter Plus and<br>Minus |
|-------------|------------------------------------|-------------------------------------------|
| Cut Lengths | 0.76, 0.89, 1.14                   | 0.025                                     |
| Cut Lengths | 1.57, 1.98, 2.39, 3.18, 3.96, 4.75 | 0.05                                      |
| Spools      | 0.18, 0.25, 0.38                   | 0.013                                     |
| Spools      | 0.51, 0.76, 0.89, 1.14             | 0.025                                     |
| Spools      | 1.57, 1.98, 2.39                   | 0.05                                      |