# AEROSPACE MATERIAL SPECIFICATION


| AMS5796™ | REV. F |
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Issued 1952-02
Revised 2018-07
Reaffirmed 2023-05

Superseding AMS5796E


## Cobalt Alloy, Corrosion- and Heat-Resistant, Welding Wire
## 52Co - 20Cr - 10Ni - 15W
## (Composition similar to UNS R30605)

RATIONALE

AMS5796F introduces exceptions (3.7), revises fabrication (3.3.2), weldability (3.4.1), length (3.6.2), reports (4.4.2) and identification (5.1.1), and is a Five-Year Review and update of this specification.

AMS5796F has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant cobalt 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 alloys of similar or dissimilar composition and requiring high strength up to 1500 °F (816 °C) and oxidation resistance up to 2000 °F (1093 °C), 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 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.

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt 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

AMS2814 Packaging and Marking of Packages of Welding Wire, Premium Quality




**TO PLACE A DOCUMENT ORDER:** **Tel: 877-606-7323 (inside USA and Canada)**
**Tel: +1 724-776-4970 (outside USA)**
**Fax: 724-776-0790**
**Email: CustomerService@sae.org**
**SAE WEB ADDRESS:** **http://www.sae.org**

**For more information on this standard, visit**
https://www.sae.org/standards/content/AMS5796F/

AMS2816 Identification, Welding Wire, Tab Marking Method

AMS2819 Identification, Welding Wire, Direct Color Code System

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

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.

ASTM E354 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 E354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

***Table 1 - Composition***

| Element | Min | Max |
|---|---|---|
| Carbon (3.1.2.1) | 0.05 | 0.15 |
| Manganese | 1.00 | 2.00 |
| Silicon | -- | 1.00 |
| Phosphorus | -- | 0.04 |
| Sulfur | -- | 0.03 |
| Chromium | 19.00 | 21.00 |
| Nickel | 9.00 | 11.00 |
| Tungsten | 14.00 | 16.00 |
| Iron | -- | 3.00 |
| Cobalt | remainder | |



3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

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 insure continued conformance to chemical composition requirements.

3.1.2.1 Carbon shall also be determined periodically on finished wire (see 4.2.2).

3.2 Condition

Cold finished, bright annealed, 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 only at diameters larger than final 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 equipment.

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, determined by a procedure acceptable to purchaser (see 8.2.1).

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 2***

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

| Form | Nominal Diameter Inch | Tolerance Inch Plus | Tolerance 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 | 0.002 | 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 tolerances, SI units***

| Form | Nominal Diameter Millimeters | Tolerance Millimeter Plus | Tolerance Millimeter Minus |
|---|---|---|---|
| Cut Lengths | 0.76, 1.14, 1.57, 1.98 | 0.05 | 0.05 |
| Cut Lengths | 2.39, 3.18, 3.98, 4.78 | 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 Lengths

Cut lengths shall be furnished in 18, 27, or 36 inches (457, 686, or 914 mm) lengths, or other lengths when specified by purchaser, and shall not vary more than +0, -0.5 inch (+0, -13 mm) from the length ordered.

3.7 Exceptions

Any exceptions shall be authorized by purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of wire shall supply all samples for producer'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

Determination of carbon on finished wire (3.1.2.1), 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 producer unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2371 and as specified herein.