# AEROSPACE MATERIAL SPECIFICATION

| AMS5692™ | REV. E |
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Superseding AMS5692D

## Steel, Corrosion and Heat-Resistant, Welding Wire
## 19Cr - 12.5Ni - 2.5Mo
## (Composition similar to UNS S31680)

RATIONALE

AMS5692E revises the winding (3.4.2.1), helix (3.4.2.2), and cast (3.4.2.3, Table 2) requirements to commercial standards and results from 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 corrosion and heat-resistant steels and alloys, 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 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 724-776-4970 (outside USA), 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





**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**

**SAE values your input. To provide feedback on this Technical Report, please visit**
**http://standards.sae.org/AMS5692E**

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

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.

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 (3.1.3) | -- | 0.08 |
| Manganese | 1.00 | 2.50 |
| Silicon | 0.30 | 0.65 |
| Phosphorus | -- | 0.030 |
| Sulfur | -- | 0.030 |
| Chromium | 18.00 | 20.00 |
| Nickel | 11.00 | 14.00 |
| Molybdenum | 2.00 | 3.00 |
| Copper | -- | 0.75 |



3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.1.2 Chemical analysis of initial ingot, bar, or rod stock before drawing, other than those analyses required to be done on the finished wire, is acceptable provided the processes used for drawing or rolling, annealing, and cleaning, are controlled to ensure continued conformance to chemical composition requirements.

3.1.3 The analysis for carbon shall be determined on finished wire.

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 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. ARP1876 may be used to resolve disputes.

3.4.2 Spooled Wire

Shall conform to 3.4.2.1, 3.4.2.2, and 3.4.2.3.

3.4.2.1 Winding

Filler metal in coils and on spools shall be wound so that kinks, waves, sharp bends, overlapping, or wedging are not encountered, leaving the filler metal free to unwind without restriction. The outside end of the electrode (the end where welding is to begin) shall be identified so it can be located readily and shall be fastened to avoid unwinding. The winding shall be level winding.

3.4.2.2 Cast

Wire, wound on standard diameter spools as shown in Table 2 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 (cast) within the limits shown in Table 2..

3.4.2.3 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 shown in Table 2.

TABLE 2A - CAST AND HELIX REQUIREMENTS, INCH-POUND UNITS

| Spool Diameter Inch | Cast Inch | | Helix Inch |
|---|---|---|---|
| | min | max | max |
| 4 | 2.5 | 9 | 0.50 |
| 8 | 10 | 20 | 0.75 |
| 12 | 15 | 30 | 1.00 |

. TABLE 2B - CAST AND HELIX REQUIREMENTS, SI UNITS

| Spool Diameter Millimeters | Cast Millimeters | | Helix Millimeters |
|---|---|---|---|
| | min | max | max |
| 102 | 64 | 229 | 13 |
| 203 | 254 | 508 | 19 |
| 305 | 381 | 762 | 25 |

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 3.

TABLE 3A - SIZES AND DIAMETER TOLERANCES, INCH/POUND UNITS

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

TABLE 3B - SIZES AND DIAMETER TOLERANCES, SI UNITS

| Form | Nominal Diameter Millimeters | Tolerance Millimeter Plus | Tolerance Millimeter Minus |
|---|---|---|---|
| Cut Lengths | 0.76, 1.14 | 0.025 | 0.025 |
| 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 | 0.51, 0.76, 0.89, 1.14 | 0.025 | 0.025 |
| Spools | 1.57, 1.98, 2.39 | 0.05 | 0.05 |