



AEROSPACE MATERIAL SPECIFICATION

AMS5840™**REV. E**

Issued	1969-05
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Superseding AMS5840D

Steel, Corrosion- and Heat-Resistant, Welding Wire
13Cr - 8.0Ni - 2.4Mo - 1.1Al
Vacuum Melted
(Composition similar to UNS S13889)

RATIONALE

AMS5840E 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 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 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
AMS2814	Packaging and Marking of Packages of Welding Wire, Premium Quality

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SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS5840E/>

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 Wire 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 (3.1.2)	--	0.05
Manganese	--	0.10
Silicon	--	0.10
Phosphorus	--	0.008
Sulfur	--	0.010
Chromium	12.25	13.25
Nickel	7.50	8.50
Molybdenum	2.00	2.50
Aluminum	0.90	1.35
Nitrogen	--	0.01
Oxygen (3.1.3)	--	0.005 (50 ppm)
Hydrogen (3.1.3)	--	0.0025 (25 ppm)

3.1.1 Chemical analysis of initial bar or rod stock before drawing is acceptable provided the process used for drawing or rolling, annealing, and cleaning are controlled to ensure continued conformance to composition requirements.

3.1.2 Each lot shall be analyzed for carbon.

3.1.3 Determination for oxygen and hydrogen is not required for cut length.

3.1.4 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248; no variation over maximum is permitted for oxygen and hydrogen.

3.2 Melting Practice

Steel shall be multiple melted using vacuum induction followed by vacuum consumable electrode practice.

3.3 Condition

Cold worked, bright finished in a temper and with a surface finish which will provide proper feeding of the wire in machine welding equipment.

3.3.1 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 In-process annealing between cold rolling or drawing operations shall be performed in vacuum or a protective atmosphere to avoid surface oxidation and absorption of other extraneous elements.

3.4.3 Butt welding is permissible provided both ends to be joined are alloy verified using a method or methods capable of distinguishing the alloy from all other alloys processed within 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.

3.4.4 Residual elements, drawing compounds, oxides, dirt, oil, dissolved gases, and other foreign materials picked up during wire processing that can adversely affect the welding characteristics, the operation of the equipment, or properties of the weld metal, shall be removed by a cleaning process that will not result in pitting or gas absorption by the wire nor deposit substances harmful to welding characteristics.

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 Spooled Wire

Shall conform to 3.5.2.1 and 3.5.2.2.

3.5.2.1 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.

3.5.2.2 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).

3.6 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 standard sizes and to the tolerances shown in Table 2 and 3.7.2.

3.7.1 Diameter

TABLE 2A - SIZES AND DIAMETER TOLERANCES, INCH/POUND UNITS

Form	Nominal Diameter Inch	Tolerance Inch 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 Millimeter Plus and 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

3.7.2 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 product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), sizes and tolerances (3.7), 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

Weldability (3.5.1), cast (3.5.2.1), and helix (3.5.2.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

In accordance with AMS2371 and as specified herein.