

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 6453

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Submitted for recognition as an American National Standard

WIRE, STEEL WELDING
0.30Cr - 1.8Ni - 0.40Mo - (0.23 - 0.28C)
Vacuum Melted, Environment Controlled Packaging

UNS K32550

1. SCOPE:

1.1 Form: This specification covers a low-alloy steel in the form of welding wire.

1.2 Application: Primarily for use as filler metal for gas-metal-arc or gas-tungsten-arc welding of steels of similar composition.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

AMS 2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels

AMS 2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock

AMS 2813 - Packaging of Welding Wire, Standard Method

AMS 2814 - Packaging of Welding Wire, Premium Quality

AMS 2815 - Identification, Welding Wire, Line Code System

AMS 2816 - Identification, Welding Wire, Color Code System

2.1.2 Aerospace Recommended Practices:

ARPI876 - Weldability Test for Weld Filler Metal Wire

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- 2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.23	0.28
Manganese	1.20	1.50
Silicon	1.30	1.70
Phosphorus	--	0.010
Sulfur	--	0.008
Chromium	0.20	0.40
Nickel	1.65	2.00
Molybdenum	0.35	0.45
Copper	--	0.35
Oxygen (3.1.2)	--	0.005 (50 ppm)
Nitrogen (3.1.2)	--	0.040 (400 ppm)
Hydrogen (3.1.2)	--	0.001 (10 ppm)

- 3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259. No variation over maximum is permitted for oxygen, nitrogen, and hydrogen (See 8.1).
- 3.1.2 Shall be determined on finished wire.
- 3.2 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.
- 3.2.1 Wire shall be furnished on disposable spools for machine welding or in cut lengths for manual welding, as ordered.
- 3.2.2 In-process annealing between cold rolling or drawing operations shall be performed in a suitable protective atmosphere.
- 3.2.3 Drawing compounds, oxides, dirt, and other foreign materials shall be removed by cleaning processes which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.
- 3.2.4 Residual elements and dissolved gases deposited on, or absorbed by, the wire as a result of cleaning or cold working operations shall be removed by vacuum degassing.

3.2.5 Annealing, if required, shall be performed under vacuum or in an inert gas atmosphere.

3.3 Properties: Wire shall conform to the following requirements:

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

3.3.2 Spooled Wire: Shall conform to 3.3.2.1 and 3.3.2.2.

3.3.2.1 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, 4 - 14 feet (1.2 - 4.3 m), to form one loop, when cut from the spool and laid on a flat surface, shall form a circle 15 - 50 inches (381 - 1270 mm) in diameter.

3.3.2.2 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).

3.4 Quality:

3.4.1 Steel shall be melted by either vacuum induction or consumable electrode vacuum arc practice.

3.4.2 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.

3.5 Sizes and Tolerances: Wire shall be supplied in the size and to the tolerances shown in 3.5.1 and 3.5.2.

3.5.1 Diameter:

TABLE I

Form	Nominal Diameter Inch	Tolerance, Inch	
		plus	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	0.003	0.003
Spools	0.007, 0.010, 0.015, 0.020	0.0005	0.0005
Spools	0.030, 0.035, 0.046	0.001	0.002
Spools	0.062, 0.078, 0.094	0.002	0.002

TABLE I (SI)

Form	Nominal Diameter Millimeters	Tolerance, Millimeter	
		plus	minus
Cut Lengths	0.76, 1.14, 1.57, 1.98	0.05	0.05
Cut Lengths	2.39, 3.18, 3.96, 4.78	0.08	0.08
Spools	0.18, 0.25, 0.38, 0.51	0.013	0.013
Spools	0.76, 0.89, 1.14	0.025	0.05
Spools	1.57, 1.98, 2.39	0.05	0.05

3.5.2 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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1) and sizes and tolerances (3.5) are acceptance tests and shall be performed on each lot, as applicable.

4.2.2 Periodic Tests: Tests for weldability (3.3.1), cast (3.3.2.1), and helix (3.3.2.2) 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: Shall be in accordance with AMS 2370.

4.4 Reports: The vendor of wire shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and stating that the wire conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 6453, nominal size, and quantity.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2370.

5. PREPARATION FOR DELIVERY:

5.1 Heat: Wire on each spool shall be of one continuous length from the same heat of steel.

5.1.1 Butt welding is permissible provided both ends to be joined are identified by chemical analysis, or the repair is made at the wire processing station, and the weld will not interfere with uniform, uninterrupted feeding of the wire in machine welding equipment.