

STEEL WELDING WIRE
1.0Cr - 1.0Mo - 0.12V (0.18 - 0.23C)
Vacuum Induction Melted

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 critical weldments of low-alloy steels requiring a weld joint capable of being heat treated to a strength approximating that of the parent metal.

1.3 Classification: Wire supplied to this specification is classified as follows:

Type I - Bare

Type II - Copper Coated

1.3.1 Type 1 shall be supplied unless Type 2 is ordered.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

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

2.1.1 Aerospace Material Specifications:

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

AMS 2350 - Standards and Test Methods

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

AMS 2814 - Packaging of Welding Wire, Premium Quality

AMS 2815 - Identification, Welding Wire, Line Code System

AMS 2816 - Identification, Welding Wire, Color Code System

SAE Technical Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

AMS documents are protected under United States and international copyright laws. Reproduction of these documents by any means is strictly prohibited without the written consent of the publisher.

AMS 6459A

- 2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E350 - 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 E350 or by spectrographic or other analytical methods approved by purchaser:

| | min | max |
|------------|------|-----------------|
| ∅ | | |
| Carbon | 0.18 | 0.23 |
| Manganese | 0.40 | 0.60 |
| Silicon | 0.60 | 0.90 |
| Phosphorus | -- | 0.015 |
| Sulfur | -- | 0.008 |
| Chromium | 0.80 | 1.20 |
| Molybdenum | 0.80 | 1.20 |
| Vanadium | 0.08 | 0.15 |
| Copper | -- | 0.50 |
| Oxygen | -- | 0.0025 (25 ppm) |
| Nitrogen | -- | 0.005 (50 ppm) |
| Hydrogen | -- | 0.0010 (10 ppm) |

- 3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259. No variation is permitted for oxygen, nitrogen, and hydrogen.

- 3.2 Condition: Cold finished, in a temper 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 and in cut lengths for manual welding, as ordered.

- 3.2.2 Drawing compounds, oxides, and dirt 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.

- 3.2.3 Residual elements and dissolved gases deposited on, or absorbed by, the wire as a result of cleaning or drawing operations shall be removed by vacuum degassing. Annealing, if required, shall be performed under vacuum or in an inert gas atmosphere.

3.2.4 Type 2 wire shall be copper coated. The flash copper coating shall be clean, bright, and uniform in appearance. A maximum of 4 discontinuities per 36 in. (900 mm) length are acceptable in copper coating provided the exposed wire is clean and bright. The maximum allowable discontinuity size shall be 0.50 in. (12.5 mm) in length. The thickness of the coating shall not exceed 0.0005 in. (12 μ m) on the diameter.

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, determined by a procedure agreed upon by purchaser and vendor.

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 the standard 12 in. (300 mm) spool shall have imparted to it a curvature such that a specimen sufficient in length, 4 - 8 ft (1.2 - 2.4 m), to form one loop, when cut from the spool and laid on a flat surface, shall form a circle not less than 15 in. (375 mm) and not greater than 30 in. (750 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 in. (25 mm).

3.4 Quality:

3.4.1 Steel shall be vacuum induction melted.

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 sizes 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, 0.045 | 0.001 | 0.002 |
| Spools | 0.062, 0.078, 0.093 | 0.002 | 0.002 |

TABLE I (SI)

| Form | Nominal Diameter Millimetres | Tolerance, Millimetre | |
|-------------|---------------------------------|-----------------------|-------|
| | | plus | minus |
| Cut Lengths | 0.75, 1.15, 1.55, 2.00 | 0.05 | 0.05 |
| Cut Lengths | 2.35, 3.10, 4.00, 4.75 | 0.08 | 0.08 |
| Spools | 0.20, 0.25, 0.40, 0.50 | 0.015 | 0.015 |
| Spools | 0.75, 0.90, 1.15 | 0.03 | 0.05 |
| Spools | 1.55, 2.00, 2.35 | 0.05 | 0.05 |

3.5.2 Length: Cut lengths shall be furnished in 18, 27, or 36 in. (450, 675, or 900 mm) lengths, as ordered, and shall not vary more than +0, -0.5 in. (-12 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. Results of such tests shall be reported to the purchaser as required by 4.4. 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 to determine conformance to requirements for composition (3.1) and tolerances (3.5) are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for weldability (3.3.1), cast (3.3.2.1), and helix (3.3.2.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2370 and as specified herein.

4.4 Reports:

4.4.1 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 of this specification. This report shall include the purchase order number, heat number, AMS 6459A, nominal size, and quantity from each heat.