

ALLOY WELDING WIRE, CORROSION AND HEAT RESISTANT  
57Ni - 19.5Cr - 13.5Co - 4.2Mo - 3.1Ti - 1.4Al - 0.006B  
Vacuum Induction Melted, Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant nickel alloy in the form of welding wire.

1.2 Application: Primarily for use as filler metal for gas-tungsten-arc or gas-metal-arc welding of parts fabricated from precipitation-hardenable nickel alloys of similar composition.

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 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock

AMS 2813 - Packaging of Welding Wire, Standard Method

AMS 2815 - Identification, Welding Wire, Line Code System

AMS 2816 - Identification, Welding Wire, Color Code System

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

ASTM E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E354 or by spectrochemical or other analytical methods approved by purchaser:

|            | min       | max   |
|------------|-----------|-------|
| Carbon     | 0.02      | 0.10  |
| Manganese  | --        | 0.10  |
| Silicon    | --        | 0.10  |
| Phosphorus | --        | 0.010 |
| Sulfur     | --        | 0.010 |
| Chromium   | 18.00     | 21.00 |
| Cobalt     | 12.00     | 15.00 |
| Molybdenum | 3.50      | 5.00  |
| Titanium   | 2.75      | 3.50  |
| Aluminum   | 1.20      | 1.60  |
| Boron      | 0.003     | 0.010 |
| Iron       | --        | 2.00  |
| Copper     | --        | 0.10  |
| Zirconium  | --        | 0.04  |
| Nickel     | remainder |       |

- 3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

- 3.2 Condition: Cold finished, solution heat treated, bright finish, 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 or in cut lengths for manual welding, as ordered.

- 3.2.2 Solution heat treatment and 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 oil 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.

- 3.3 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 standard 12-in. (600-mm) diameter spools shall have imparted to it a curvature such that a specimen sufficient in length, 4 - 8 ft (1200 - 2400 mm), to form one loop, when cut from the spool and laid on a flat surface, shall form a circle 15 - 30 in. (375 - 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 Alloy shall be produced by vacuum induction melting; it may be remelted using consumable electrode vacuum process but remelting is not required.

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, 0.094        | 0.002           | 0.002  |

TABLE I (SI)

| Form        | Nominal Diameter<br>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                | 0.02                  | 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 sizes 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 2371 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 5828D, nominal size, and quantity.

4.4.2 When parts made of this wire or assemblies requiring use of this welding wire are supplied, the part or assembly manufacturer shall inspect each lot of wire to determine conformance to the technical requirements of this specification and shall furnish with each shipment a report stating that the wire conforms. This report shall include the purchase order number, AMS 5828D, part or assembly number, and quantity.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.