



AEROSPACE MATERIAL SPECIFICATION

AMS5682™

REV. F

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Superseding AMS5682E

Nickel Alloy, Corrosion- and Heat-Resistant, Welding Wire
78Ni - 20Cr (8020)

(Composition similar to UNS N06003)

RATIONALE

AMS5682F is the result of a Five-Year Review and update of the specification. The revision updates composition testing and reporting (see 3.1 and 3.1.2), prohibits unauthorized exceptions (see 3.7, 4.4.1, 5.3.1, and 8.4), adds country of origin in reports (see 4.4), and allows the use of prior revisions (see 8.3).

1. SCOPE

1.1 Form

This specification covers a corrosion- and heat-resistant nickel alloy in the form of rods and wire.

1.2 Application

This wire has been used typically as bare wire filler metal for application of a heat- and corrosion-resistant coating by gas-tungsten-arc or gas-metal-arc welding, 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 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

AMS2283 Composition Testing Methods for Nickel- and Cobalt-Based 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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For more information on this standard, visit
<https://www.sae.org/standards/content/AMS5682F/>

| | |
|---------|---|
| 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 |
| AS7766 | Terms used in AMS Specifications |

2.2 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Wire shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2283 or by other analytical methods acceptable to the purchaser.

Table 1 - Composition

| Element | Min | Max |
|----------------|-----------|------|
| Carbon | 0.15 | 0.30 |
| Manganese | 0.60 | 1.00 |
| Silicon | -- | 0.30 |
| Chromium | 19.0 | 21.0 |
| Cobalt (3.1.1) | -- | 1.0 |
| Iron | -- | 1.0 |
| Nickel | remainder | |

3.1.1 Determination of this element is not required for routine acceptance.

3.1.2 The producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection unless limits of acceptability are specified by the purchaser.

3.1.3 Check Analysis

Composition variations shall meet the requirements of AMS2269.

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

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.

3.3 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.

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 gases, 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. ARP1876 may be used to resolve disputes.

3.4.2 Spooled Wire

Shall conform to 3.4.2.1 and 3.4.2.2.

3.4.2.1 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 to 14 feet (1.2 to 4.3 m), 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.

3.4.2.2 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).

3.5 Quality

Wire, as received by the 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 Tolerances

3.6.1 Wire shall be supplied in the sizes shown in Table 2.

Table 2A - Wire sizes and tolerances, inch/pound units

| Form | Nominal Diameter Inches | Tolerance Inches Plus | Tolerance Inches Minus |
|-------------|--|-----------------------------|------------------------------|
| Cut Lengths | 0.030, 0.035, 0.045 | 0.001 | 0.002 |
| 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, 0.062 | 0.001 | 0.002 |
| Spools | 0.078, 0.094 | 0.002 | 0.002 |

Table 2B - Wire sizes and tolerances, SI units

| Form | Nominal Diameter Millimeters | Tolerance Millimeters Plus | Tolerance Millimeters Minus |
|-------------|------------------------------------|----------------------------------|-----------------------------------|
| Cut Lengths | 0.76, 0.89, 1.14 | 0.025 | 0.05 |
| 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 | 0.051, 0.76, 0.89, 1.14, 1.57 | 0.025 | 0.05 |
| Spools | 1.98, 2.39 | 0.05 | 0.05 |

3.6.2 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 (+0, -13 mm) from the length ordered.

3.6.3 Other diameters and cut lengths shall be as agreed between the purchaser and supplier.

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The supplier of the wire shall supply all samples for the supplier's tests and shall be responsible for the performance of all required tests. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (see 3.1), sizes and tolerances (see 3.6), and alloy verification (see 5.2) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Weldability (see 3.4.1), cast (see 3.4.2.1), and helix (see 3.4.2.2) are periodic tests and shall be performed at a frequency selected by the supplier unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Sampling and testing shall be in accordance with AMS 2371.

4.4 Reports

The supplier of the wire shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), the results of tests for composition of each heat, and stating that the wire conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS5682F, size, and quantity.

4.4.1 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS5682F(EXC) because of the following exceptions:" and the specific exceptions shall be listed (see 5.3.1).