

AEROSPACE MATERIAL SPECIFICATION



AMS 4784F

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Superseding AMS 4784E

Gold-Palladium-Nickel Alloy, Brazing Filler Metal, High Temperature
50Au - 25Pd - 25Ni
2015 to 2050 °F (1102 to 1121 °C) Solidus-Liquidus Range
(Composition similar to UNS P00500)

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

1. SCOPE:

1.1 Form:

This specification covers a gold-palladium-nickel alloy in the form of wire, rod, sheet, strip, foil, pig, powder, shot, chips, preforms, and a viscous mixture (paste) of the powder in a suitable binder.

1.2 Application:

This filler metal has been used typically for joining corrosion and heat-resistant steels and alloys where corrosion and oxidation-resistant joints with good strength at elevated temperatures are required, but usage is not limited to such applications.

1.3 Classifications:

Filler metal supplied to this specification is classified as follows:

- Class 1 Standard composition
- Class 2 Supplementary composition control

Where no class is specified, Class 1 shall apply.

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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

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2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2222 Tolerances, Copper and Copper Alloy Sheet, Strip, and Plate

MAM 2222 Tolerances, Metric, Copper and Copper Alloy Sheet, Strip, and Plate

AMS 2224 Tolerances, Copper and Copper Alloy Wire

MAM 2224 Tolerances, Metric, Copper and Copper Alloy Wire

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 214 Sieve Analysis of Granular Metal Powders

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by spectrochemical methods or other analytical methods acceptable to purchaser (See 8.3).

TABLE 1 - Composition

Element	min	max
Gold	49.50	50.50
Palladium	24.50	25.50
Nickel	24.50	25.50
Other Elements, total (3.1.1)	--	0.15

3.1.1 Determination not required for routine acceptance.

3.1.2 For Class 2, copper shall be limited to 0.06% maximum, carbon to 0.005% maximum, and the following elements shall be limited to 0.002% maximum each; aluminum, cadmium, lead, magnesium, phosphorus, silicon, and zinc. The total of these elements shall not exceed 0.05% maximum.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Wire: Clean and bright. Annealed temper, unless otherwise specified.

3.2.2 Rod: As fabricated, and cleaned.

3.2.3 Sheet, Strip, and Foil: Cold rolled and annealed unless otherwise specified.

3.2.4 Pig, Powder, Shot, and Chips: As fabricated.

3.2.5 Paste: Unless otherwise specified by the purchaser, shall consist of 84 to 90% by weight powder in a suitable binder and shall not contain flux.

3.2.6 Preforms: As fabricated.

3.3 Properties:

Filler metal shall conform to the following requirements:

3.3.1 Color: Shall be yellow-white.

3.3.2 Flatness: When unrolled, strip and foil shall lie flat with no undue tendency to recoil.

3.3.3 Paste:

3.3.3.1 Paste shall have a shelf life of not less than six months from date of manufacture; not more than thorough mixing shall be required to restore paste for use during that time.

3.3.3.2 Paste without flux shall leave no adherent residue when heated in a protective atmosphere to a temperature higher than 1000 °F (538 °C).

3.4 Quality:

The product, as received by purchaser, shall be uniform in color, quality, and condition and free from foreign materials and from imperfections detrimental to its working qualities. Wire, rod, sheet, strip, and foil shall be clean, sound, bright, and free from slivers, splitting, ragged edges, damaged ends, and other injurious imperfections. Pig, powder, shot, and chips shall have a metallic luster.

3.5 Sizes and Tolerances:

The product shall be supplied in the following standard sizes and to the tolerances shown.

3.5.1 Wire and Rod:

3.5.1.1 Nominal Diameters: Shall be as shown in Table 2.

TABLE 2 - Standard Diameter Sizes

Inch	Millimeters
0.005	0.13
0.007	0.18
0.010	0.25
0.015	0.38
0.025	0.64
0.031	0.79
0.040	1.02
0.047	1.19
0.062	1.57
0.094	2.39
0.125	3.18
0.175	4.44
0.188	4.78
0.225	5.72
0.250	6.35

3.5.1.2 Diameter Tolerances for Drawn Wire and Rod: Shall be in accordance with AMS 2224 or MAM 2224 as applicable to refractory alloys.

3.5.1.3 Diameter Tolerances for Rolled or Extruded Wire and Rod: Shall be as shown in Table 3.

TABLE 3A - Diameter Tolerances, Inch/Pound Units

Nominal Diameter or Distance Between Parallel Sides Inch	Tolerances, Inch Plus and Minus Rounds	Tolerances, Inch Plus and Minus Squares
0.031 to 0.062, incl	0.005	0.008
Over 0.062 to 0.125, incl	0.006	0.009
Over 0.125 to 0.188, incl	0.007	0.009
Over 0.188 to 0.250, incl	0.008	0.010

TABLE 3B - Diameter Tolerances, SI Units

Nominal Diameter or Distance Between Parallel Sides Millimeters	Tolerances, Millimeter Plus and Minus Rounds	Tolerances, Millimeter Plus and Minus Squares
0.79 to 1.57, incl	0.13	0.20
Over 1.57 to 3.18, incl	0.15	0.23
Over 3.18 to 4.78, incl	0.18	0.23
Over 4.78 to 6.35, incl	0.20	0.25

3.5.2 Sheet, Strip, and Foil:

3.5.2.1 Nominal Thicknesses: Shall be as shown in Table 4.

TABLE 4 - Standard Thicknesses

Inch	Millimeter
0.001	0.025
0.0015	0.038
0.002	0.05
0.003	0.08
0.004	0.10
0.005	0.13
0.006	0.15
0.008	0.20
0.010	0.25
0.014	0.36
0.020	0.51
0.030	0.76

3.5.2.2 Tolerances:

3.5.2.2.1 Thickness: Nominal thicknesses under 0.002 inch (0.05 mm) shall have a tolerance of ± 0.0002 inch ($\pm 5 \mu\text{m}$); nominal thicknesses 0.002 inch (0.05 mm) and over shall have tolerances conforming to AMS 2222 or MAM 2222 as applicable to refractory alloys.

3.5.2.2.2 Width of Individual Rolls: Nominal widths under 6 inches (152 mm) shall vary not more than ± 0.010 (± 0.25 mm) from the width ordered. Nominal widths 6 inches (152 mm) and over shall vary not more than ± 0.015 inch (± 0.38 mm) from the width ordered.

3.5.2.2.3 Length in Individual Roll: Shall not be limited except that no roll shall weigh more than 75 pounds (34 kg).

3.5.3 Powder:

3.5.3.1 Mesh Designations: 60, 100, 140, 200, and 325.

3.5.3.2 Powder shall be supplied in accordance with the limits on particle size distribution shown in Table 5, unless some other distribution is specified. Tests shall be in accordance with ASTM B 214.

TABLE 5 - Particle Size Distribution

Mesh Designation	U.S. Standard Sieve
60	Through a No. 40 sieve - 100%
	Through a No. 60 sieve - 95% minimum
	Through a No. 325 sieve - 10% maximum
100	Through a No. 60 sieve - 100%
	Through a No. 100 sieve - 95% minimum
	Through a No. 325 sieve - 15% maximum
140C	On a No. 100 sieve - 0.5% maximum
	On a No. 140 sieve - 10% maximum
	Through a No. 325 sieve - 20% maximum
140F	On a No. 100 sieve - 0.5% maximum
	On a No. 140 sieve - 10% maximum
	Through a No. 325 sieve - 55% maximum
200	On a No. 140 sieve - 0.5% maximum
	On a No. 200 sieve - 10% maximum
	Through a No. 325 sieve - 65% maximum
325	On a No. 200 sieve - 0.5% maximum
	On a No. 325 sieve - 10% maximum
	Through a No. 325 sieve - 90% minimum

3.5.3.2.1 When a mesh designation is not specified, 140F shall be supplied.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product 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: All technical requirements, other than shelf life of paste (3.3.3.1), are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Shelf life of paste (3.3.3.1) is a periodic test 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 the following:

4.3.1 Composition: One sample shall be taken from each furnace charge.

4.3.2 Properties Except Shelf Life of Paste: One sample from each lot.

4.3.3 A lot shall be all product, other than powder or paste, which has been tested and found to conform to 3.1, in the same temper and size, and presented for vendor's inspection at one time.

4.3.4 A lot of powder shall be a uniform blend of powder produced from one or more furnace charges, each meeting the requirements of 3.1, and presented for vendor's inspection at one time.

4.3.5 A lot of paste shall be that paste produced from a single lot of powder combined with binder from the same manufacturing batch and presented for vendor's inspection at one time.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the composition requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number or numbers, AMS 4784F, form, size, and quantity.

4.5 Resampling and Retesting:

Not applicable.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

5.1.1 Shall be as agreed upon by purchaser and vendor.

5.1.2 Each exterior container or package shall be permanently and legibly marked with not less than AMS 4784F, lot number, form, manufacturer's identification, nominal sizes, and weight.

5.1.2.1 Each container and package of paste shall also be marked with the date of manufacture.