SAE The Engineering Resource For Advancing Mobility
400 COMMONWEALTH DRIVE WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4771E
Superseding AMS 4771D

Issued 8-15-58
Revised 1-1-84

BRAZING FILLER METAL, SILVER
50Ag - 16Cd - 15.5Zn - 15.5Cu - 3.0Ni
1170°- 1270°F (630° - 690°C) Solidus-Liquidus Range UNS P07501

1. SCOPE:

1.1 Form: This specification covers a silver alloy in the form of wire, rod, sheet, strip, foil, pig, powder, shot, and chips and a viscous mixture (paste) of powder in a suitable binder.

1.2 Application: Primarily for joining ferrous metals, including austenitic steels and alloys, where high joint strength up to 400°F (205°C) is required, and for joining nonferrous metals except those having base of aluminum or magnesium.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) 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 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
AMS 2350 - Standards and Test Methods

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

ASTM B214 - Sieve Analysis of Granular Metal Powders
ASTM E56 - Chemical Analysis of Silver Brazing Alloys

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

2.4 AWS Publications: Available from American Welding Society, Inc. 550 North LeJeune Road, Miami, FL 33135.

ANS Z49.1 - Safety in Welding and Cutting

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E56, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Silver	49.0 -	51.0
Cadmium	15.0 -	17.0
Zinc	13.5 -	17.5
Copper	14.5 -	16.5
Nickel	2.5 -	3.5
Other Elements, total (3.1.1)	--	0.15

3.1.1 Determination not required for routine acceptance.

3.1.2 The requirements of 3.1 apply to paste after removal of the binder.

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Wire: Cold drawn or cold rolled, as ordered, in annealed temper, and cleaned.

3.2.2 Rod: Cold drawn, cold rolled, or extruded, as ordered, in hard temper, and cleaned.

3.2.3 Sheet, Strip, and Foil: Cold rolled, hard.
Ø

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

3.2.5 Paste: Shall consist of 84 - 90% by volume powder in a suitable binder
Ø and, unless otherwise agreed upon by purchaser and vendor, shall not contain flux.

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 shall leave no undesireable residue when heated in a protective atmosphere to 1000°F (540°C) or higher.

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, unless otherwise specified:

3.5.1 Wire and Rod:

3.5.1.1 Nominal Diameters:

Inch		Millimetres	
0.005	0.062	0.12	1.55
0.007	0.094	0.18	2.35
0.010	0.125	0.25	3.12
0.015	0.175	0.38	4.40
0.025	0.188	0.62	4.70
0.031	0.225	0.78	5.60
0.040	0.250	1.00	6.25
0.047		1.18	

3.5.1.2 Diameter Tolerances for Drawn Wire and Rod: AMS 2224 or MAM 2224 as applicable to refractory alloys.

3.5.1.3 Diameter Tolerance for Rolled or Extruded Wire and Rod:

TABLE I

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

TABLE I (SI)

Nominal Diameter or Distance Between Parallel Sides Millimetres	Tolerance, Millimetre Plus and Minus	
	Rounds	Squares
0.78 to 1.55, incl	0.12	--
Over 1.55 to 3.12, incl	0.15	--
Over 3.12 to 4.75, incl	0.18	0.22
Over 4.75 to 6.25, incl	0.20	0.25

3.5.2 Sheet, Strip, and Foil:

3.5.2.1 Nominal Thicknesses:

Inch		Millimetre	
0.001	0.006	0.02	0.15
0.0015	0.008	0.038	0.20
0.002	0.010	0.05	0.25
0.003	0.014	0.08	0.35
0.004	0.020	0.10	0.50
0.005	0.030	0.12	0.75

3.5.2.2 Tolerances:

3.5.2.2.1 Thickness: Nominal thicknesses under 0.002 in. (0.05 mm) shall have a tolerance of ± 0.0002 in. (±5 μm); nominal thicknesses 0.002 in. (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 in. (150 mm) shall vary not more than ±0.010 in. (±0.25 mm) from the width ordered. Nominal widths 6 in. (150 mm) and over shall vary not more than ±0.015 in. (±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 lb (35 kg).

3.5.3 Powder:

3.5.3.1 Nominal Sizes: -60, -100, -200, and -325.

3.5.3.2 Tolerances: Nominal sizes shown in 3.5.3.1 shall be supplied in accordance with the following limit on particle size distribution, tested in accordance with ASTM B214:

Nominal Size	Not Less Than 95% Through U.S. Standard or Tyler Sieve Number
-60	60
-100	100
-200	200
-325	325

3.5.3.2.1 Control of fines shall be as specified by purchaser.

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 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 product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each lot.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Composition: One sample from each lot.

4.3.2 Properties: One sample from each lot.

4.3.3 Other Technical Requirements: As agreed upon by purchaser and vendor.

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

4.3.5 A lot of powder shall be a uniform blend of powder produced from one or more furnace charges and presented for vendor's inspection at one time.

4.3.6 Ø A lot of paste shall be that 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:

4.4.1 The vendor of the product shall furnish with each shipment three copies of 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 of this specification. This report shall include the purchase order number, lot number, AMS 4771E, form, size, and quantity from each lot.

4.4.2 When parts made of this filler metal or assemblies requiring use of this filler metal are supplied, the part or assembly manufacturer shall inspect each lot of filler metal to determine conformance to the technical requirements of this specification and shall furnish with each shipment three copies of a report stating that the filler metal conforms. This report shall include the purchase order number, AMS 4771E, part or assembly number, and quantity.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

5.1.1 The product shall be identified as agreed upon by purchaser and vendor.