

## AFM Deoxidized Copper

AWS/SFA A5.7 Class ERCu

### Description:

**AFM Deoxidized Copper** is generally used for the welding of deoxidized and electrolytic tough pitch copper. Reactions with hydrogen in oxygen-free copper, and the segregation of copper oxide in tough pitch copper may detract from joint efficiency. It can be used to weld these base metals when the highest quality is not required.

### Applications:

For thick base metals, gas metal arc welding (GMAW) is preferred. Conventional joint designs consistent with good welding practice are generally satisfactory. An external source of preheating generally is not needed when welding base metal 1/4" (6.4mm) and thinner in thickness. Preheating in the range of 400 to 1000°F (205 to 540°C) is desirable when welding base metal thicker than 1/4" (6.4mm) if high-quality welds are to be obtained.

### Chemical Composition Requirements (%):

Cu*	98.0 min.	P	0.15
Sn	1.0	Al	0.01
Mn	1.0	Pb	0.02
Si	0.50	Total Other	0.50

\*including Silver (Ag)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	25,000
MPa	172
Brinell Hardness, Rockwell F (average value for an as-welded deposit)	25

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2)

## AFM Silicon Bronze

AWS/SFA A5.7 Class ERCuSi-A

### Description:

**AFM Silicon Bronze** is a copper-base alloy containing approximately 3 percent of silicon, it may also contain small percentages of manganese, tin, or zinc. It is used for gas tungsten (GTAW) and gas metal arc welding (GMAW) of copper-silicon and copper-zinc base metals, to themselves and also to steel.

### Applications:

When gas metal arc welding (GMAW) with **AFM Silicon Bronze**, it is generally best to keep the weld pool small and the interpass temperature below 150°F (65°C) to minimize hot cracking. The use of narrow weld passes reduces contraction stresses and also permits faster cooling through the hot-short temperature range. When gas tungsten arc welding (GTAW), best results are obtained by keeping the weld pool small. Preheating is not required. Welding can be done in all positions, but the flat position is preferred.

### Chemical Composition Requirements (%):

Cu*	BAL	Si	2.8-4.0
Zn	1.0	Al	0.01
Sn	1.0	Pb	0.02
Mn	1.5	Total Other	0.50
Fe	0.50		

\*including Silver (Ag)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	50,000
MPa	345
Brinell Hardness (average value for an as-welded deposit)	80 to 100

### Standard Sizes:

.023 (0.6), .030 (0.8), .035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2), 5/32 (4.0)

## AFM Alum-Brnz A1

AWS/SFA A5.7 Class ERCuA1-A1

### Description:

**AFM Aluminum Bronze A1** is an iron-free aluminum bronze. It is recommended for use as a surfacing metal for wear-resistant surfaces having relatively light loads, for resistance to corrosive media such as salt or brackish water, and for resistance to many commonly used acids in varying concentrations and temperatures. It is *not* recommended for joining.

### Chemical Composition Requirements (%):

Cu*	BAL	Al	6.0-8.5
Zn	0.20	Pb	0.02
Mn	0.50	Total Other	0.50
Si	0.10		

\*including Silver (Ag)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	55,000
MPa	345
Brinell Hardness	80 to 110
(average value for an as-welded deposit)	

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2)

## AFM Alum-Brnz A2

AWS/SFA A5.7 Class ERCuA1-A2

### Description:

**AFM Aluminum Bronze A2** is an iron-bearing aluminum bronze and is generally used for joining aluminum bronzes of similar composition, manganese, silicon bronzes, some copper-nickel alloys, ferrous metals and dissimilar metals. The most common dissimilar metal combinations are aluminum bronze to steel and copper to steel. It is used to provide wear- and corrosion-resistant surfaces.

### Chemical Composition Requirements (%):

Cu*	BAL	Al	8.5-11.0
Zn	0.02	Pb	0.02
Fe	1.50	Total Other	0.50
Si	0.10		

\*including Silver (Ag)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	60,000
MPa	414
Brinell Hardness (GTAW only)	130 to 150
(average value for an as-welded deposit)	

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2), 5/32 (4.0)

## AFM Alum-Brnz A3

AWS/SFA A5.7 Class ERCuA1-A3

### Description:

**AFM Aluminum Bronze A3** is a higher strength aluminum bronze used for joining and repair welding of aluminum bronze castings of similar composition, and for depositing bearing surfaces and wear- and corrosion-resistant surfaces.

### Chemical Composition Requirements (%):

Cu*	BAL	Al	10.0-11.5
Zn	0.10	Pb	0.02
Fe	2.0-4.5	Total Other	0.50
Si	0.10		

\*including Silver (Ag)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	65,000
MPa	450
Brinell Hardness (GTAW only) (average value for an as-welded deposit)	140 to 180

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2)

## AFM 40

AWS /SFA A5.7 ERCuNiMnAl

### Description:

**AFM 40** manganese-nickel-aluminum bronze filler metal used for joining and repairing of cast or wrought base metals of similar composition. This filler metal may also be used for surfacing applications where high resistance to corrosion, erosion, or cavitation is required.

### Chemical Composition Requirements (%):

Cu*	BAL	Pb	0.02
Zn	0.15	Al	7.0-8.5
Mn	11.0-14.0	Si	0.10
Fe	2.0-4.0	Ni**	1.5-3.0
Total Other	0.50		

\*includes Silver (Ag)

\*\*including Cobalt (Co)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	75,000
MPa	515
Brinell Hardness (GTAW only) (average value for an as-welded deposit)	160 to 200

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2)

## AFM 46

AWS/SFA A5.7 Class ERCuNiA1

### Description:

**AFM 46** nickel-aluminum bronze is used for joining and repairing of cast or wrought nickel-aluminum bronze base metals.

### Chemical Composition Requirements (%):

Cu*	BAL	Ni**	4.0-5.50
Zn	0.10	Al	8.50-9.50
Mn	0.60-3.50	Pb	0.02
Fe	3.0-5.0	Total Other	0.50
Si	0.10		

\*including Silver (Ag)

\*\*including Cobalt (Co)

All values are considered maximum unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	72,000
MPa	480
Brinell Hardness (GTAW only)	160 to 200

(average value for an as-welded deposit)

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2)

## AFM Phos-Bronze A

AWS/SFA A5.7 Class ERCuSn-A

### Description:

**AFM Phosphorous Bronze A** contains about 5 percent tin and up to 0.35 percent phosphorous added as a deoxidizer. Tin increases wear resistance of the weld metal and slows the rate of solidification by broadening the temperature differential between the liquidus and solidus. This slower solidification increases the tendency to hot shortness. To minimize this effect, the weld pool should be kept small and welding time as short as possible. **AFM Phosphorous Bronze A** can be used to weld bronze and brass. It also can be used to weld copper if the presence of tin in the weld is not objectionable.

### Chemical Composition Requirements (%):

Cu*	BAL	Al	0.01
Sn	4.0-6.0	Pb	0.02
P	0.10-0.35	Total Other	0.50

\*including Silver (Ag)

All values are considered maximum, unless otherwise noted.

### Hardness and Tensile Strength:

Minimum Tensile Strength, psi	35,000
MPa	240
Brinell Hardness	70 to 85

(average values for an as-welded deposit)

### Standard Sizes:

.035 (0.9), .045 (1.2), 1/16 (1.6), 3/32 (2.4), 1/8 (3.2), 5/32 (4.0)

## AFM Low Fuming Bronze

AWS/SFA A5.8 RBCuZn-C

### Description:

**AFM Low Fuming Bronze** is a brazing alloy used on steels, copper, copper alloys, nickel, nickel alloys, and stainless steel. It is used with the torch, furnace, and induction brazing processes. Fluxing is required, and a borax-boric acid flux is commonly used. Joint clearances from 0.002 to 0.005 in. (0.05 to 0.13 mm) are suitable.

### Chemical Composition Requirements (%):

Cu	56.0-60.0	Pb(a)	0.05
Zn	BAL	Al(a)	0.01
Sn	0.80-1.10	Si	0.04-0.15
Fe	0.25-1.20	Total Other	0.50
Mn	0.01-0.50		

a. The total of these elements shall not exceed the value specified in Total Other.

All values are considered maximum, unless otherwise noted.

### Nominal Temperature Ranges:

Solidus		Liquidus		Brazing Temperature Range	
°F	°C	°F	°C	°F	°C
1590	866	1630	888	1670-1750	910-954

### Standard Sizes:

1/16 (1.6), 3/32 (2.4), 1/8 (3.2), 5/32 (4.0), 3/16 (4.8), 1/4 (6.4), 5/16 (8.0), 3/8 (9.5)

Also available in Flux Coated Bronze:

### Standard Sizes:

3/32 (2.4), 1/8 (3.2), 5/32 (4.0), 3/16 (4.8)  
10# tubes / 50# master carton

## AFM NICKEL SILVER

AWS/SFA A5.8 Class RBCuZn-D

### Description:

**AFM Nickel Silver** is a brazing filler metal primarily used for brazing tungsten carbide. It is also used with steel, nickel, and nickel alloys. It can be used with all brazing processes. It is unsuitable for furnace brazing in a protective atmosphere.

### Chemical Composition Requirements (%):

Cu	46.0-50.0	Pb(a)	0.05
Zn	BAL	Al(a)	0.01
Ni	9.0-11.0	Si	0.04-0.25
P	0.25	Total Other	0.50

a. The value of these elements shall not exceed the values specified in Total Other.

All values are considered maximum, unless otherwise noted.

### Nominal Temperature Ranges:

Solidus		Liquidus		Brazing Temperature Range	
°F	°C	°F	°C	°F	°C
1690	921	1715	935	1720-1800	938-982

### Standard Sizes:

1/16 (1.6), 3/32 (2.4), 1/8 (3.2), 5/32 (4.0), 3/16 (4.8), 1/4 (6.4)

## AFM Phos. Bronze C

AWS/SFA A5.6 Class ECuSn-C

### Description:

**AFM Phosphorous Bronze C** electrodes are used to join phosphor bronzes of similar compositions. It is also useful for joining brasses and, in some cases, for welding them to cast iron and carbon steel. The higher tin content in **AFM Phosphorous Bronze C** results in weld metals of higher hardness, tensile and yield strength than in the Phosphorous Bronze A weld metal.

The weld metals tend to flow sluggishly, requiring preheat and interpass temperatures of at least 400°F (205°C) on heavy sections. Postweld heat treatment may not be necessary, but it is desirable for maximum ductility, particularly if the weld metal is cold worked.

### Chemical Composition Requirements (%):

Cu*	BAL	Ni**	(a)
Zn	(a)	P	0.05-0.35
Sn	7.0-9.0	Al	0.01
Mn	(a)	Pb	0.02
Fe	0.25	Total Other	0.50
Si	(a)		

\*including Silver (Ag)

\*\*including cobalt (Co)

a. These elements must be included in Total Other elements.

All values are considered maximum, unless otherwise noted.

### Mechanical Property Requirements (min.):

Tensile Strength, psi	40,000
MPa	280
Elongation in. 4 x D gage length, (%)	20

### Standard Sizes:

3/32 (2.4), 1/8 (3.2), 5/32 (4.0), 3/16 (4.8)

## AFM Alum-Brnz A2

AWS/SFA A5.6 Class ECuAl-A2

### Description:

**AFM Aluminum Bronze A2** is used for joining aluminum bronzes of similar composition, high strength copper-zinc alloys, silicon bronzes, manganese bronzes, some nickel alloys, many ferrous metals and alloys, and combinations of dissimilar metals. It is also suitable for surfacing wear- and corrosion-resistant bearing surfaces. It is used only in the flat position.

### Applications:

For butt joints, a 90 degree single V-groove is recommended for plate thicknesses up to and including 7/16 in. (11 mm), and a modified U- or double V-groove is recommended for the heavier plate thicknesses. Preheat and interpass temperature should be as follows:

For iron-base materials, 200 to 300°F (95 to 150°C).

For bronzes, 300 to 400°F (150 to 210°C).

For brasses, 500 to 600°F (260 to 315°C).

### Chemical Composition Requirements (%):

Cu*	BAL	Si	1.50
Zn	(a)	Ni**	(a)
Sn	(a)	Al	6.5-9.0
Mn	(a)	Pb	0.02
Fe	0.50-5.0	Total Other	0.50

\*including Silver (Ag)

\*\*including Cobalt (Co)

a. These elements must be included in Total Other elements.

All values are considered maximum, unless otherwise noted.

### Mechanical Property Requirements (min.):

Tensile Strength, psi	60,000
MPa	410
Elongation in. 4 x D gage length, (%)	20

### Standard Sizes:

3/32 (2.4), 1/8 (3.2), 5/32 (4.0), 3/16 (4.8)