AMP M/A-COM

White Bronze

High Quality Surface Plating & Excellent Intermodulation Performance for RF-Connectors

Introduction

M/A-COM's new White Bronze surface finish represents a dramatic improvement upon the wear characteristics and life expectancy of silver plating, at the same time offering a far better electrical performance than nickel. White Bronze plated connectors exhibit intermodulation characteristics significantly better than stainless steel or nickel plated products. Silver has always been the preferred finish from an electrical standpoint but its corrosion and wear characteristics especially in harsh conditions are often unacceptable. While nickel is an extremely rugged finish it has properties undesirable in many RF applications; including, high RF and insertion losses, poor intermodulation performance, high permeability and poor screening effectiveness.

M/A-COM's White Bronze is composed of copper, tin and zinc which are applied simultaneously to produce a finished color similar to stainless steel. With one of the most advanced industrial electroplating facilities in the world M/A-COM can achieve the levels of control over the complex galvanic process necessary in the application of this alloy.

M/A-COM's industrial electroplating facilities is one of the most advanced in the world.

M/A-COM's White Bronze is similar in composition and performance to other copper/tin/zinc alloys developed in the industry such as Sucoplate® and BBR.

Comprehensive conditioning tests have been performed to provide a thorough evaluation of M/A-COM's White Bronze plated connector bodies. The tests were performed to the specifications of the European and International RF connector standards — CECC 22000/IEC 68-2-14/IEC 169-1. The results are summarized on page 3.

Deposit Characteristics

Composition:	Copper (55-60%), Tin (20-25%), Zinc (15-20%)
Density:	7.9-8.1 g/cm^3
Hardness:	300-380 HV
Passivation:	Immersion Chrome

Advantages

The M/A-COM White Bronze finish offers the following advantages:

- low intermodulation
- high corrosion resistance
- low porosity
- low RF losses
- non magnetic
- wear & scratch resistant

Low Intermodulation Products

Dissimilar metals, finishes and discontinuities within a coaxial line structure give rise to intermodulation products (IMP). This is of particular concern in applications requiring low levels of intermodulation, such as cellular base stations and antennas. White Bronze plated connectors offer better IMP performance and lifetime characteristics than nickel. Due to the similarity of electrolytic potentials and the non magnetic properties of the finish, levels of intermodulation are commensurate with silver and far in excess of stainless steel/nickel connectors. At the same time the excellent wear characteristics and durability of the finish ensure that the intermodulation life of the connector is greater than

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silver. The life is also improved as a direct result of the excellent corrosion resistance properties of White Bronze; thereby minimizing metal/metal oxide junctions.

Highly Corrosion Resistant

Even under continuous exposure to harsh environments White Bronze retains its aesthetic appearance. Unlike silver it does not discolor when exposed to sulphur, potassium sulphides etc., neither is there any build up in oxide layers as is the case with nickel. Furthermore White Bronze parts have successfully passed all international salt spray tests (MIL, BS, CECC, IEC).

In conditions of continuously high temperatures (>100°C) and/or excessive humidity (>100%) there is no build up of foreign layers which may affect contact resistance.

Low Porosity & No Reaction With Contact Surfaces

Less than 2μm of White Bronze is needed to create a completely nonporous, corrosion resistant surface. M/A-COM applies White Bronze to a thickness of between 2μm and 3μm. This compares favorably with the typical plating thickness of nickel (>10μm) and consequently, variations in plating depth are significantly less.

White Bronze does not alloy with brass and since its coefficient of expansion is virtually identical to that of brass, rapid temperature shocks (-50°C/200°C) do not cause blistering or cracking of the plating.

The electrolytic potential of White Bronze is approximately that of brass. Consequently any White Bronze plated connectors in contact with stainless steel, silver, nickel or nickel containing finishes carry no risk of corrosion as a result of any chemical potential difference.

Low RF Losses

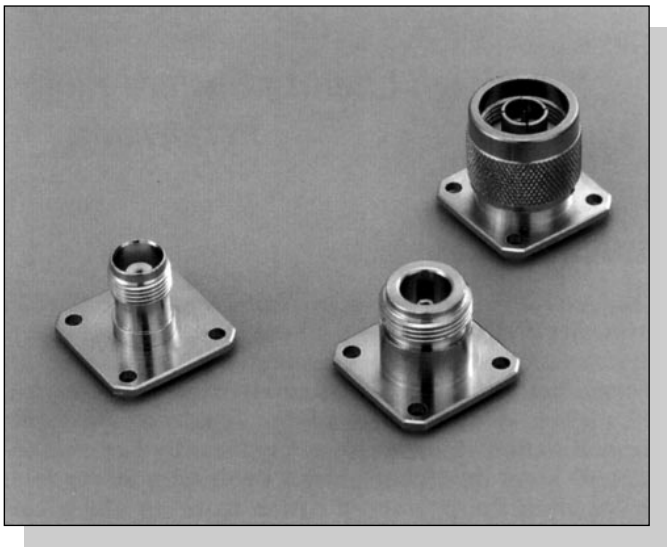
The relative permeability (μr) of M/A-COM's White Bronze is 1 giving rise to low RF losses even at high frequencies. As a direct result of the good conductivity of the finish, skin depth is minimized further reducing insertion loss and ensuring a better impedance match across the frequency range of the connectors.

Non Magnetic Finish

M/A-COM's White Bronze contains no ferrous materials and so has no magnetic properties. This is particularly desirable in many RF applications.

Low Coefficient of Friction

The coefficient of friction is approximately 70% that of silver to give lower insertion forces and smoother coupling. These properties combine to produce a harder wearing, longer lasting finish which prolongs connector life and reduces the ongoing cost of ownership.



White Bronze is available on all products, including 7/16, N, TNC, OSP and SMA's.

Wear & Scratch Resistant

The hardness of M/A-COM's White Bronze at 300-380HV is more than double that of silver and marginally harder than platings containing nickel. This gives a scratch resistance which is rarely surpassed and makes it ideal for high mating applications.

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M/A-COM's White Bronze

Environmental Test

Four groups of conditioning tests were performed to provide a comprehensive evaluation of M/A-COM's White Bronze plated connector bodies. The tests were performed to the specifications of the European and International RF connector standards - CECC 22000/ IEC 68-2-14/IEC 169-1. Full details and relevant data are available from M/A-COM and results are summarized below.

Test 1 - Industrial Atmosphere & Temperature Endurance

1.1 Industrial Atmosphere

Exposure to Sulphur Dioxide Atmosphere (as specified in IEC 68-2-42 Test Kc) for 21 days of mated connectors, previously subjected to 500 matings, to determine the influence of sulphur dioxide on the corrosion resistance properties of White Bronze Plating. Contact resistance measured after matings and sulphur dioxide exposure was less than 5% (0.23mohm) of the permissible specification.

1.2 High Temperature Endurance

Exposure to temperatures of 85°C ±5°C for 250 hours, to determine the impact of prolonged high temperatures on plating adhesion. Prior to testing the connectors were subject to 500 matings. Results showed no visual deterioration in plating finish (blistering, cracking etc.) and the results of outer conductivity performance were comparable to Test 1 (above).

Test 2 - Rapid Temperature Change & Damp Heat Steady State

2.1 Rapid Temperature Change

Exposure to -55°C and +85°C for 15 minutes, transition time 2-3 minutes, 50 cycles. To determine possible plating deterioration caused by prolonged and rapid temperature change. No visual deterioration, outer conductivity performance were comparable with Test 1 (above).

2.2 Damp Heat Steady State

Exposure to 93% relative humidity (at 40°C) for 10 days. To determine plating adhesion. No visual deterioration, outer conductivity performance were comparable with Test 1 (above).

Test 3 - Soldering Heat

3.1 Resistance to Soldering Heat

Exposure to concentrated soldering heat (250°C) for 10 seconds to evaluate any possible deterioration in plating finish. No deterioration detected.

Test 4 - Salt Mist & Mechanical Endurance

4.1 Salt Mist

Exposure to salt mist spray (as defined in BS 2011 Pt. 2.1 Ka) for 48 hours to evaluate the uniformity of protective coatings, any visual deterioration, or impact on electrical performance. No visual deterioration, outer conductivity performance were comparable with Test 1 (above).

4.2 Mechanical Endurance

Electrical and visual evaluation of the connectors after 500 matings to determine any electrical or visual deterioration. No visual deterioration, outer conductivity performance were comparable with Test 1 (above).

Availability & Ordering

M/A-COM offers White Bronze on all products including 7/16, N, TNC, SMA and OSP's.

For more information on White Bronze contact your local M/A-COM Sales Office.

Sucoplate® is a plating trademark for Huber & Suhner.
BBR is a plating trademark for Radiall.

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