

A large industrial radial plating machine with three vertical cylindrical racks. Each rack is filled with numerous small, silver-colored metal components, likely connectors or pins, arranged in a radial pattern. The machine is mounted on a sturdy metal frame with various cables and hoses visible in the background.

BRIGHT- BRONZE- RADIAL PLATING

Guidelines

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INTRODUCTION

In today’s market, Radiall’s BBR (Bright-Bronze-Radiall) stands out as one of the highest-quality surface finishes for RF connectors and microwave components, suitable for both indoor and outdoor applications. BBR offers intermodulation characteristics comparable to those of silver, while significantly outperforming nickel or passivated stainless steel. As a cost-effective alternative to gold, BBR provides: good corrosion resistance, superior electrical performance compared to nickel and non-allergenic properties.

MAIN ADVANTAGES OF BBR

- Low Intermodulation
- Excellent Corrosion Resistance
- High Abrasion Resistance
- Good Conductivity
- Low Surface Friction
- Solderability
- Environmentally Friendly

CONDUCTIVITY & CONTACT RESISTANCE

BBR - BRIGHT-BRONZE-RADIALL

BBR (Bright-Bronze-Radiall) is a high-quality surface finish that delivers an excellent balance of electrical, mechanical and environmental properties. It is a Copper-Tin-Zinc alloy plating (composition: Copper 55%, Tin 30%, Zinc 15%).

GOOD CONDUCTIVITY

BBR is designed for optimal electrical performance, ensuring minimal RF insertion loss in connectors and microwave components, even at high frequencies, thanks to its non-magnetic composition (free from ferrous materials or nickel).

Key benefits include:

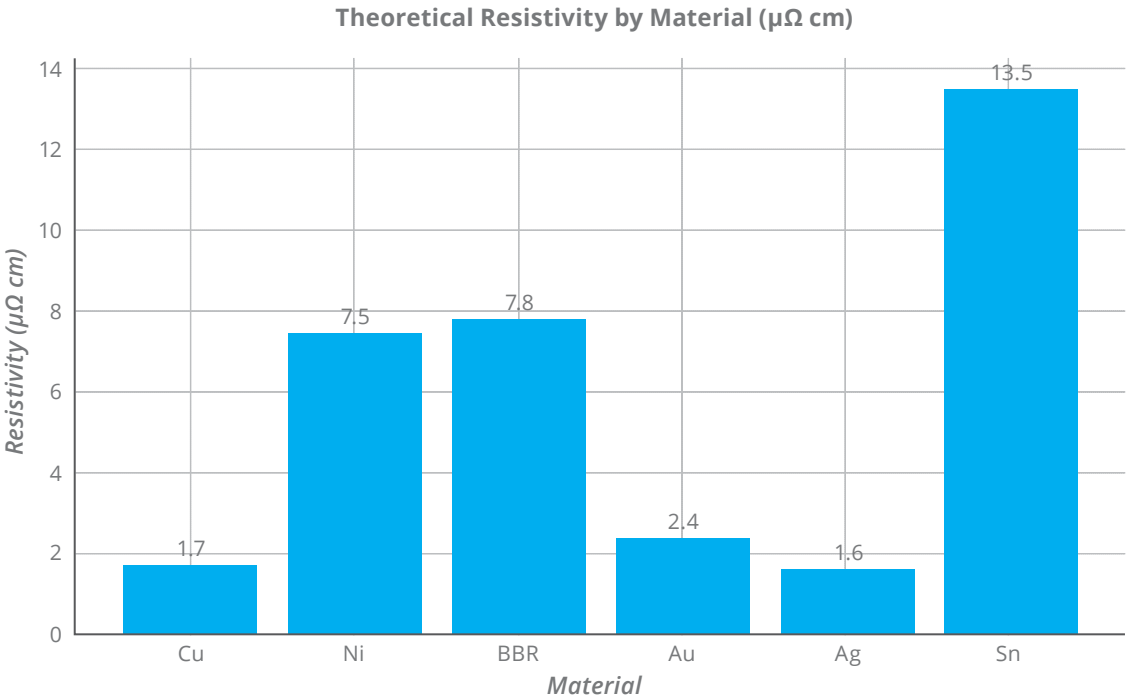
- **High Power Transmission:** Efficient transmission of high power signals.
- **Reduced RF Insertion Losses:** Ensures reliable performance in high-frequency applications.
- **Enhanced Critical Components:** When paired with a silver underlayer on specific parts, such as spring outer contacts, BBR achieves exceptional conductivity without the risk of tarnishing or corrosion.

CONTACT RESISTANCE

BBR’s contact resistance levels are between those of nickel plating and hard gold plating (Au 99.7%), making it an ideal solution for most RF connector parts, excluding center contacts.

Key benefits related to contact resistance include:

- **Optimal Performance:** Reliable electrical connections with balanced resistance.
- **Cost-Effective Solution:** Combines the advantages of multiple plating options while maintaining cost efficiency.



INTERMODULATION

BBR (Bright-Bronze-Radiall) is designed to minimize intermodulation products in RF connectors and microwave components. Thanks to its non-magnetic properties and excellent corrosion resistance, BBR is well-suited for applications requiring stable and reliable performance in environments prone to intermodulation challenges.

KEY ADVANTAGES

- **Non-Magnetic Properties:** The absence of ferrous materials ensures minimal intermodulation, maintaining signal integrity in demanding RF environments.
- **Corrosion Resistance:** BBR’s robust resistance to corrosion significantly reduces the risk of intermodulation caused by dissimilar metals or environmental degradation.
- **Mechanical Endurance:** Its durable composition ensures consistent performance, even under mechanical stress or repeated mating cycles.

BBR provides a dependable solution for low-intermodulation applications, combining non-magnetic characteristics and superior environmental resistance to meet the needs of modern RF systems.



MECHANICAL CHARACTERISTICS

DUCTILITY

Radiall BBR demonstrates a ductility comparable to electrolytic Radiall nickel plating. This high level of ductility, combined with excellent adhesion to all copper-based alloys used in the connector and microwave components industry, enables BBR to be plated on any type of part, including those requiring crimping.

HARDNESS

The hardness of BBR is slightly higher than that of Radiall nickel plating and approximately five times greater than silver plating. The exceptional hardness, combined with a low coefficient of friction, provides excellent wear resistance and significantly outperforms conventional nickel plating.

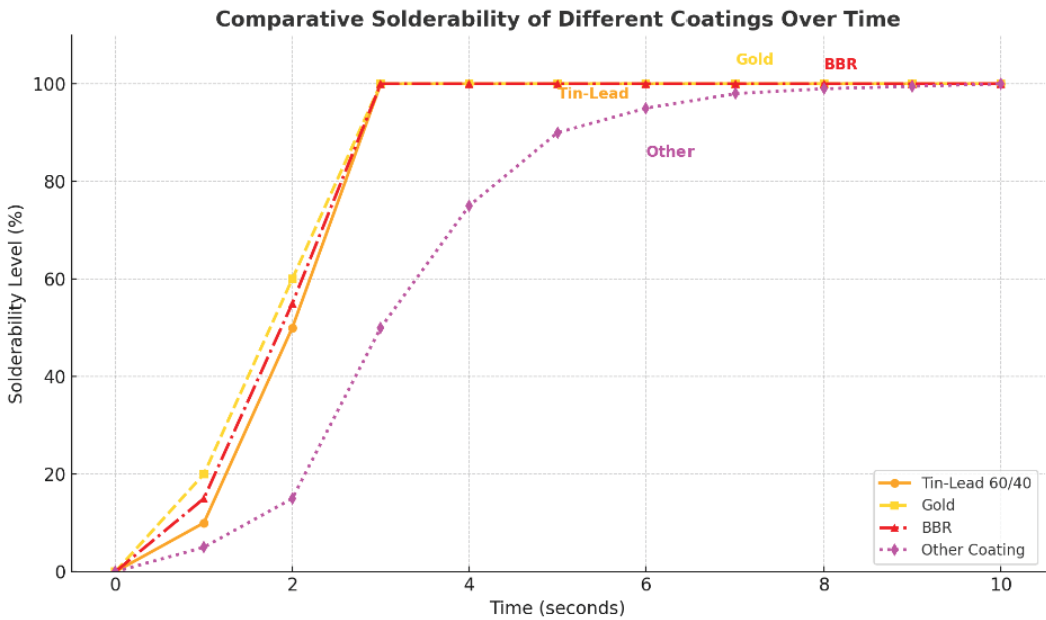
COEFFICIENT OF FRICTION

Radiall BBR’s coefficient of friction is 70% lower than that of conventional silver plating. Fewer wear particles are generated during mating and demating operations, thereby extending the lifespan of connectors.

Radiall BBR offers a unique combination of ductility, hardness and a low coefficient of friction, ensuring exceptional mechanical performance and durability in RF connectors and microwave components.

SOLDERABILITY

Comparative quantitative tests performed by Radiall on MCX PCB receptacles using Meniscograph equipment (tin-lead 60/40 - 235°C - RMA Flux - duration 10s) demonstrate the solderability of four types of coatings. After 3 seconds, BBR achieves a solderability level equivalent to tin-lead and gold when an appropriate flux is used.



KEY BENEFITS OF BBR IN SOLDERABILITY

- **Enhanced Solderability:** BBR plating on PCB connectors significantly improves solderability compared to nickel plating.
- **Standards Compliance:** BBR is solderable according to the IEC-68-2-20 standard, using standard tin-lead 60/40 material and low-activated flux (rosin with less than 0.5% chloride).
- **Long-Term Reliability:** BBR maintains its solderability even after extended storage periods.

Radiall’s BBR offers excellent solderability, ensuring reliable connections and enhanced performance for PCB connectors.



ENVIRONMENTAL TESTS

CORROSION: SALT MIST

BBR successfully passes the salt mist test (96 hours at 35°C with 5% NaCl) to evaluate its resistance to sea coast atmospheres and its compatibility with various base metals and undercoatings. No changes in contact resistance were observed, thanks to BBR's low galvanic potential with base metals like copper and brass.

ENVIRONMENTAL CHARACTERISTICS

CORROSION AND TARNISHING RESISTANCE

Corrosion and tarnishing resistance, two of its most important environmental features, make BBR excel. The low relative electrolytic potential of BBR with common base materials (such as copper and brass) prevents corrosion caused by high galvanic potential differences, which are common with other finishes. Additionally, BBR's tarnishing endurance far surpasses that of silver, keeping BBR bright and free from discoloration. This ensures the preservation of all electrical characteristics over time. Unlike silver-plated connectors, which degrade in contact resistance and intermodulation level after standard corrosive tests, BBR-finished connectors maintain their performance.

NON-POROUS PLATING

BBR's low level of porosity, which is superior to that of nickel, ensures a fully sealed, non-porous finish with a plating thickness of 2 µm.

EXCELLENT COVERAGE PROPERTIES

BBR offers excellent coverage properties, even in internal holes, and ensures a consistent deposit in terms of depth. This makes BBR one of the best electrolytic platings in the electronics industry, significantly outperforming nickel.

Radiall's BBR provides exceptional environmental characteristics, including superior corrosion and tarnishing resistance, non-porous plating and excellent coverage, ensuring long-lasting performance and reliability in electronic applications.

BBR has excellent performance in industrial gas exposure tests, maintains stable electrical characteristics and meets standard requirements even after prolonged exposure to corrosive environments and multiple matings.

MOISTURE TESTS

BBR-plated parts were exposed to high humidity environments over a 10-day period (cyclic humidity, 10 cycles, MIL-STD 202 Method 106) or 21 days (damp heat steady state, 40°C, 95% RH). These conditions did not cause any significant impact on appearance or the connectors' outer contact resistance.

HIGH TEMPERATURE ENDURANCE

Exposure to 155°C for 1000 hours did not affect the appearance or contact resistance of BBR. No issues with plating adhesion were observed.

THERMAL SHOCKS

To test temperature resistance and transfer shocks, BBR-plated parts underwent 5 cycles at -55 °C/+155 °C with transfer times under 20 seconds. The plating showed no adhesion issues or cracking, confirming excellent performance.

Notes

Adding a silver underlayer does not affect these test results. When an ultra-low level of intermodulation products is required, a silver undercoating can be used without risking corrosion. Nickel and silver do not pass all these industrial atmosphere tests.

ADDITIONAL INFORMATION

“GREEN” PLATING

BBR is environmentally friendly and free of heavy metals like cadmium and chromium. Its nickel-free composition complies with the European directive DG-XI-76/769, ensuring it is non-allergenic.

APPEARANCE

Radiall BBR has a gray appearance.

AVAILABILITY

BBR is available for all Radiall coaxial connectors, including SMA, BMA, N and 7/16.

SPECIFICATIONS

BBR meets standard requirements for RF connectors, including MIL 39012, IEC 1169 and CECC 22000. Qualified on representative parts in a CECC/IEC-approved lab, the BBR process undergoes regular audits to ensure continuous improvement and total quality.

RADIAL ELECTROPLATING FACILITIES

Radiall’s plating facilities are among the most advanced in the electronics industry. The implementation of Statistical Process Control (SPC) in manufacturing processes ensures high-finish quality through continuous monitoring of thickness and alloy composition. Additionally, the facilities adhere to waste treatment legislation, with water quality checked regularly through daily, weekly and quarterly sampling.



SIMPLIFICATION is our INNOVATION

We advance the design and engineering process for innovators, groundbreakers and pioneers of technology. We reduce weight, improve durability and streamline installation to provide leading-edge connectors that drive product performance.

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GLOBAL PRESENCE

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