Antitarnish-M-100

Process for the tarnish protection of silver and copper – for technical components (i.e. plug-in and sliding contacts) as well as decorative applications.

Characteristics
Antitarnish-M-100 is based on an aqueous, metal-free solution in which the organic inhibitor is present as a fine dispersion. The passivation layer is applied by immersion and is specially designed for silver surfaces.

A thin transparent layer will protect the silver against tarnishing generally caused by hydrogen sulfide. The layer will neither effect the solderability nor the bondability compared to an untreated silver surface.

The conductivity and the contact resistance will hardly be effected. Depending on the application, in reel-to-reel equipment either a depot layer or a thin monolayer can be applied. Neither colour nor brightness of the silver coatings will be negatively influenced.

The protection of palladium, copper and thin gold layer from tarnish processes is possible as well. Due to its chemical composition, the protective film also acts as a lubricant.

The immersion solution Antitarnish-M-100 does not contain any components harmful for the environment, no chlorofluorohydrocarbons, chlorinated hydrocarbons, aromatic hydrocarbons or chromium compounds in particular.

Properties
Bath: Aqueous, metal-free immersion process
Colour: Uninfluenced
Brightness: Uninfluenced
Friction coefficient: Hardly reduced
Sliding properties: Improved
Solderability: Uninfluenced
Bondability: Uninfluenced
Contact resistance: Hardly influenced

Form of Supply
Antitarnish-M-100 is delivered as a high-concentrate in 100ml-bottles, 1000ml-bottles or 10 litre cans.

The concentrate must be stored in a frost-protected place. Storage stability of at least 18 months refers to a status in closed original package.

Necessary Equipment
Bath tanks: Preferably polypropylene tanks provided with a built-in overflow. The overflow is important to ensure that there is no foam floating on the bath surface. Otherwise there will be stains on the surface of the parts when taking them out of bath and getting in contact with foam on surface.

Heating: Temperature adjustable heaters (coated with quartz, teflon or porcelain). Ensure sufficient recirculation and avoid local overheating of the bath.

Agitation equipment: Parts and/or bath should be sufficiently agitated in order to reach an uniform tarnish protection. Bath agitation can be done with an immersion pump.

Exhaust system: Recommended since concentrate and makeup-solution have a particular smell.

Bath Makeup
Makeup: Take 960 ml of DI-water and fill it into the clean bath tank. Heat up to operation temperature (40°C). Warm up Antitarnish-M-100 to 40°C, shake thoroughly and add the desired volume of the concentrate (normally 10ml/l; range: 5-50 ml/l). Always pour the product, do not use pipettes, even for small amounts. After filling up with DI-water to a volume of 1 litre and thorough mixing, the solution is ready for use.

Replenishment: According to throughput continuous replenishment of Antitarnish-M-100 is recommended. To apply tarnish-protection on 1000 sqm surface there are required approximately 500ml Antitarnish-M-100.

Operating Conditions
Concentration: 10 ml/l (range: 5-50 ml/l) Antitarnish-M-100.
Operation temperature: 40°C (35-45°C). Operating temperature should strictly not exceed 60°C, otherwise bath components will be destroyed. You will see a too high temperature because the solution becomes cloudy and opaque at temperatures above 52°C.

pH-value: No control required. Weakly alkaline.
Agitation: Slow agitation by means of a pump and agitation of the parts is recommended.
Filtration: Strictly prohibited.
Time of exposure: Rack/Barrel: 120 s (30-240 s) Reel-to-reel: 10 s (5-20 s)
Antitarnish-M-100

Process Sequence

The recommended optimum process sequence is as follows:

- Rack / Barrel:

  Process sequence – Rack / Barrel

  1. Silver plating
  2. Static rinse
  3. Flow rinse
  4. Antitarnish-M-100
  5. Static rinse
  6. Flow rinse
  7. Drying

- Reel-to-reel equipment:

  Process sequence – Reel-to-reel equipment

  1. Silver plating
  2. Static rinse
  3. Rinse
  4. Antitarnish-M-100
  5. Rinse
  6. Blow off/dry
  7. Static rinse
  8. Dry / blow off

Alternatively for monolayers (continue after step 4 with):

Process sequence – Reel-to-reel equipment

  1. Rinse in DI-water
  2. Drying
  3. Static rinse
  4. Flow rinse
  5. Antitarnish-M-100
  6. Drying

The process sequence depends on the surface quality of the silver plated parts to be protected. Old silver surfaces must be cleaned, degreased and activated with an acid dip before protecting. But normally the parts come from a last galvanic silver bath, are rinsed with water and then get their protection with Antitarnish-M-100. After the protection bath parts must get a two step rinse to maintain a shiny surface. The first rinse should be a static rinse with hot water (50 - 60°C). The second step is a flow rinse with DI water. Then the parts can be dried.

To avoid stains from Antitarnish-M-100 particles (foam etc.), the static rinse can be improved by addition of 1% of Antitarnish-POST-DIP. Then a water temperature of 40 - 50°C is sufficient. This solution can also be used to compensate evaporation losses of the Antitarnish-M-100 solution.

Drying:

The parts will come out of the antitarnish solution and the rinses mainly unwetted, i.e. with just a few drops of water on the surface.

The drying can be done in forced air ovens and in case of strip material in continuous furnaces at less than 150°C or by blowing off.

Controlling and correction of bath function

Testing the tarnish protection capacity:

Prepare a fresh 2% solution of potassium polysulfide (42-45%) and put the tarnish-protected parts in this solution for a few minutes (see appendix on page 3).

Perfectly passivated surfaces must not show any dark discoloration anywhere. A slightly cloudy appearance is normal. Put also an unpassivated part into the solution to see the difference.

In case of a poor tarnish-protection the concentration of Antitarnish-M-100 must be analytically determined (see appendix on page 3) and adjusted.

If there is no improvement after having adjusted the concentration the antitarnish solution must be freshly made-up.

Further Process Recommendations

Pretreatment: The parts to be protected must be clean and free from grease and oxides. The parts should be either wetted or have an active surface when placed in the solution. Drag-in from previous electrolytes should be strictly avoided by careful rinsing.

Easy removal of the protective coating: The tarnish-protection can be completely removed by cathodic degreasing in an alkaline degreasing bath (i.e. use electrolytic degreasing salt ED-100).

Disposal of spent solutions

The working solution of Antitarnish-M-100 is no hazardous substance. The active ingredients can be absorbed by active carbon and burnt with it. We recommend to stir the spent antitarnish solution with 4g/l of active carbon for some hours at room temperature and to filter it afterwards. Due to drag-in sometimes silver and cyanide accumulate in the antitarnish solution. In these cases a treatment for the oxidation of cyanide and the precipitation of the heavy metals will be required. The spent solution treated in this way may be discharged into the site’s sewage system. The instructions of the local water/sewage authorities must be observed in any case.

Safety Hints

For information on safety, please see the corresponding Material Safety Data Sheets. The valid accident prevention regulations and safety information must be observed.
APPENDIX

Analysis Methods for Antitarnish-M-100

1.) The inhibitor concentration can be determined using the following method of analysis:

**Equipment:**
- 250 ml Erlenmeyer flask
- 20 ml volumetric pipette
- 25 ml burette

**Chemicals:**
- Sulfuric acid 30%
- iodine solution 0.1 N
- sodium thiosulfate solution 0.1 N

- **Antitarnish-TITRATION-ADD** (ask for this product at METAKEM)

**Method:**
- Pipet 50 ml of the warm, homogeneous process solution into a 250 ml Erlenmeyer flask mixed with about 10 ml Antitarnish-TITRATION-ADD and add about 5 ml sulfuric acid (30%).
- Dilute this solution with 50 ml deionised water.
- Add 10 ml 0.1 N iodine solution and shake thoroughly before the sample stands at a dark place for about 15 minutes.
- Titrate the resultant red-brown solution with 0.1 N sodium thiosulfate solution until the red-brown colour changes to the white colour of the original solution.

**Calculation:**

Concentration of Antitarnish-M-100 (ml/l) = \(10 – \text{consumption of } 0.1 \text{ N } \text{Na}_2\text{S}_2\text{O}_3\) x 6

2.) Method for testing the antitarnish protection of an electroplated silver layer:

**Chemicals:**
- 2% aqueous solution of potassium polysulfides
  (20 g potassium polysulfides 42-45% solved in 1.0 l deionized water.)

A fresh solution should always be prepared before testing. The temperature should not be higher than 25 °C.

**Method:**
- The test sample (passivated part) and the control sample will be dipped for 5 minutes in a 2% aqueous solution of potassium polysulfides, after that the parts will be rinsed in running water.

A non-passivated part is tested as a reference at the same time.

**Interpretation:**
Perfectly passivated parts should not show any dark colour changes (spots).
The control sample is used for checking the usability of the testing solution.

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