

Black-Magic[®] Silver Solder

Black-Magic Silver Solder is a companion product to our hot black oxide products. It blackens difficult to blacken silver solder and brazed areas to blend in without affecting the black oxide conversion coating on steel.

Features & Benefits

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|--------------------------------|--------------------------------|
| Free-flowing granular product | Ease of operation |
| Blackens hard to blacken areas | Brazed and silver solder areas |

Operating Conditions

Black-Magic Silver Solder is a free-flowing granular product used at a concentration of 2 lb per gallon of water solution and at a boiling point of approximately 220°F.

Solution Makeup

Rectangular Tank - Solution Level 6" from top.

$$\text{Black-Magic Salts} = \frac{\text{L" x W" x (D"-6") x 2 lb per Gal}}{\text{231 cubic inches per Gal}}$$

Lb salt required for initial solution

Compute the amount of salts required by using the above equation. Fill the tank a little less than half full of cold water. Do not apply heat currently. Start adding the salts to the water with continuous stirring to avoid the formation of lumps. When the required amount of Black-Magic Silver Solder salts has been added, continue to stir and fill the tank with water to within 6" from the top.

Heat is then applied to the solution, and as the temperature rises, it should be stirred frequently to ensure thorough mixing and a uniform temperature throughout. When the temperature reaches approximately 220°F, the solution should begin to boil. If it does not, water should be slowly added until it begins to simmer. If the solution boils before reaching 220°F, additional Black-Magic Silver Solder salts must be added and stirred into the solution.

When the Black-Magic Silver Solder solution is boiling in the range of 220°F to 225°F, it is ready for processing work. Although the temperature of the solution can be maintained by



Cleaning
the Hard to Clean



Finishing
the Hard to Finish



Treating
the Hard to Treat

manually adding water, an automatic indicating temperature controller should be used. The only reason for the boiling point to rise is due to the evaporation of water. The automatic temperature controller will replenish this water as needed to maintain the correct boiling point and concentration. An automatic controller also relieves the operator of the responsibility for maintaining the temperature; and it ensures consistent, uniform, high-quality finishes.

If the temperature of the solution climbs above 225°F, water must be added to replenish evaporated water and reduce the temperature. Extreme care must be taken when adding water at high temperatures to avoid splattering and eruptions. In order to safely add water and control the boiling point of the solution, water should be introduced by a water feed pipe, hung across the backside of the tank, near the top, with 1/8" or 3/16" holes, drilled 2" apart which directs incoming water against the tank wall into the Black-Magic Silver Solder solution.

Do not introduce water below the surface of the solution. We recommend that an automatic indicating temperature controller and motor operated water inlet valve be used to safely control the additions of water. The automatic controller will replenish evaporated water as needed to maintain the correct boiling temperature and concentration. It will also protect against the undesirable and detrimental overheating of the solution. Automating the water additions will relieve the operator of the responsibility for maintaining the temperature and ensures consistent, uniform, high-quality black finishes. Hubbard-Hall can recommend suppliers of automated temperature controllers and water inlet valves with the preferred drilled piping to introduce the water along the rear wall of the tank above the solution level. Consult us for advice prior to installing a water inlet to a tank.

Equipment

The Black-Magic Silver Solder tank should be constructed of mild steel along with the cleaning and rinse tanks. Acid pickling tanks should be plastic, rubber-lined steel or rigid Polypropylene.

Gas heated units are preferred and should be under fired and insulated. Units heated by electric immersion heaters should also be constructed of mild steel and insulated. Racks, hooks and baskets must be constructed of mild steel. Non-ferrous metals such as galvanized iron, bronze, copper, tin or aluminum should not be used for racks or baskets as these materials will contaminate the Black-Magic Silver Solder solution.

Your Hubbard-Hall representative can recommend suppliers to assist you in selecting and installing the proper controls as well as the complete tank system required for the process.

Hot alkaline cleaning, acid pickling and the Black-Magic Silver Solder solutions should be exhausted. The duct work may be of the same materials as recommended above for the tanks. Galvanized steel should not be used.



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Finishing Procedure

Since Black-Magic Silver Solder is normally used in the same line and following the appropriate Hubbard-Hall hot black oxide product, the parts are handled in the same tumbling barrels, baskets and racks without transfer or interruption in the processing sequence. The normal procedure is as follows:

1. Thoroughly clean and degrease pieces with the appropriate Hubbard Hall cleaner. A typical cleaning time is five to ten minutes.
2. Rinse in bottom-fed, overflowing cold water rinse.
3. Immerse in the appropriate Hubbard-Hall hot black oxide product solution (boiling at 280°F to 290°F) until a uniform, deep black color is developed. Immersion time will be from 5 to 20 minutes, depending upon the mass of parts and type of condition of the steel.
4. Rinse in bottom-fed, overflowing cold water rinse.
5. Immerse in Black-Magic Silver Solder solution at approximately 220°F to boiling for an immersion time of 2 to 5 minutes or until the brazed areas are black.
6. Rinse in bottom-fed, overflowing cold water rinse.
7. Seal the finish by immersing for 2 to 3 minutes in the appropriate Hubbard-Hall Metal Guard to obtain the desired finish and / or corrosion protection.

Note: If the pieces to be blackened have scale or rust on the surface, it must be removed in a 50% by volume Muriatic Acid solution or in an 8 oz to 1 lb per gallon solution of the appropriate Hubbard-Hall **Acid Salt**.

Operating Tips

Problems will be held to a minimum with a properly maintained and controlled Black-Magic Silver Solder solution. Most problems can be traced to inadequate cleaning or improper temperature control. The following tips are offered for successful operation of the solution.

1. A glass mercury thermometer should be kept on hand to check the accuracy of the automatic temperature controller.
2. Frequent small additions of replenishment salts will produce more uniform results than large amounts added less frequently.
3. Ideally, the temperature of the solution should not drop below boiling when work is introduced. Enough heat should be maintained to ensure that the solution does not drop below the boiling point for more than a few minutes, even with the heaviest loads.
4. A thorough final rinse after blackening will minimize contamination of the sealant solutions.



Titration Method

1. Pipette a 5 mL sample into 250 mL Erlenmeyer.
2. Add 50 mL DI water plus 5 to 10 drops Phenolphthalein indicator.
3. Titrate with 0.5 N Hydrochloric to clear endpoint.
4. Record mL used.

Calculation

$$\text{Black-Magic Silver Solder (lb/Gal)} = \text{mL } 0.5 \text{ N HCl} \times 0.04$$

Caution

THIS MATERIAL CONTAINS CAUSTIC SODA. CAUSES SEVERE BURNS.

Do not get in eyes, skin or clothing. Avoid breathing dusts or mists. Do not take internally. When handling, wear goggles or face shield. While making solutions, add slowly to surface of solution to avoid violent spattering.

In case of contact, immediately flush skin or eyes with plenty of water for at least fifteen minutes. For eyes, call a physician.

The Black-Magic Silver Solder bath should be adequately exhausted.

WARRANTY: THE QUALITY OF THIS PRODUCT IS GUARANTEED ON SHIPMENT FROM OUR PLANT. IF THE USE RECOMMENDATIONS ARE FOLLOWED, DESIRED RESULTS WILL BE OBTAINED. SINCE THE USE OF OUR PRODUCTS IS BEYOND OUR CONTROL, NO GUARANTEE EXPRESSED OR IMPLIED IS MADE AS TO THE EFFECTS OF SUCH USE, OR THE RESULTS TO BE OBTAINED.

Our people. Your problem solvers.

For more information on this process please call us at

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