



# Product Bulletin

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## BLACK MAGIC® SS

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### BLACK OXIDE FINISH FOR STAINLESS STEEL

**BLACK MAGIC® SS** patented oxidizing salts are a free-flowing, dust-free, granular composition used in water at a concentration of 4-3/4 lbs. per gallon of solution. The alkaline solution is used at a low boiling temperature of 250-260°F. to blacken a wide variety of stainless steels and meets the requirements of MIL-C-13924, Class 4. The solution is also capable of blackening cast and malleable irons as well as steel, although for superior quality finishes, Hubbard-Hall **BLACK MAGIC® SS-C** is recommended for cast iron and "**Activated**" **Black Magic® "Plus"** is recommended for steel.

#### SOLUTION MAKEUP

Rectangular Tank - Solution level 6" from top.

$$\text{BLACK MAGIC® SS} \quad L" \times W" \times (D"-6") \times 4\text{-}3/4\text{lbs.per gallon}$$

$$= \frac{\hspace{10em}}{\hspace{10em}}$$

Lbs.salt required for initial solution      23l cubic inches per gallon

Compute the amount of salts required by using the above equation. Fill the tank a little less than half full with cold water. Do not apply heat at this time. Start adding the salts to the water with continuous stirring to avoid the formation of lumps. When the required amount of Black Magic® 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 250-260°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 250°F., additional Black Magic® salts must be added and stirred into the solution. Black Magic® is used as a super-saturated solution, and it should be allowed to boil for at least one hour before additional salt is added to ensure that the true boiling point has been reached with all of the salts thoroughly dissolved.

When the Black Magic® solution is boiling in the range of 250-260°F., it is ready for processing work. Although the temperature of the solution can be maintained by 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. It will also protect against the undesirable and detrimental overheating of the solution. An automatic controller also relieves the operator of the responsibility for maintaining the temperature; and it ensures consistent, uniform, high-quality finishes.

#### FINISHING PROCEDURE

Stainless steels to be blackened may be processed in baskets, tumbling barrels, hung on racks or hooks, depending upon the shape and weight and production requirements.

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1. Thoroughly clean and degrease pieces with Hubbard-Hall's MI-CLEAN™ 14 or 31 hot (180°F.) alkaline soak cleaners, or with MI-CLEAN™ 100, a heavy-duty low temperature (65-160°F.) alkaline soak cleaner. A typical cleaning time is 5 to 10 minutes.
2. Rinse in bottom-fed, overflowing cold water rinse.
3. Activate the stainless steel surface with a 5 minute immersion in a 50% by volume muriatic acid solution, used at room temperature.
4. Rinse in bottom-fed, overflowing cold water rinse.
5. Immerse in Black Magic® solution (boiling at 250-260°F.) until a uniform, deep black color is developed. Immersion time usually will be from 2 to 15 minutes, depending upon the mass of parts and the type and condition of the stainless steel.
6. Rinse in bottom-fed, overflowing cold water rinse.
7. Seal the finish by immersing for one minute in Hubbard-Hall's METAL GUARD® 510 for an oily finish; METAL GUARD® 300 or METAL GUARD® 450 for a soft, "dry-to-touch finish"; or METAL GUARD® 600 for a hard, dry finish.

By nature, stainless steel surfaces are passive. Thus in preparing the metal surface prior to blackening, it is necessary to use an acidic pickle. This depassivates the surface slightly to enable the blackening solution to react with it to produce the black finish. On occasion, the 50% by volume muriatic acid solution may not sufficiently activate the metal surface. In this instance, stronger measures are required with the following pickle:

90% by volume Muriatic Acid  
5% by volume Sulfuric Acid  
5% by volume Water

This pickle is also used at room temperature, with a minimum immersion time of 5 minutes. Note that in preparing this solution, the sulfuric acid must be slowly added to cold water. This mixture must be allowed to cool before adding the Muriatic Acid.

A third, stronger activation procedure consists of the following:

After pickling at room temperature in one of the above Muriatic Acid solutions, proceed as follows:

4. Rinse in bottom-fed, overflowing cold water rinse.
  - A. Immerse in sulfamic acid to produce the required depassivation. Used at a concentration of 1 to 2 pounds of sulfamic acid per gallon of water, the solution temperature is maintained between 150 to 180°F., with immersion times of 30 seconds to 3 minutes. A 25% by volume sulfuric acid solution and QUICK PIK 1 can be used as an alternative.
  - B. Rinse in bottom-fed, overflowing cold water rinse and continue with blackening Step 5.

### **OPERATING TIPS**

Problems will rarely arise with a properly maintained and controlled Black Magic® solution. Most problems can be traced to insufficient surface preparation of the work or an incorrect boiling temperature. Other tips would include:

1. A glass 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. Sufficient 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. Maximum loads should not exceed 1 lb. of work per 1/2 gallon of solution. Optimum loads

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would be approximately 1 lb. of work to one gallon of solution, including the weight of barrels, baskets and racks.

4. Transfer time from the Black Magic® bath to the rinse water should be as short as possible to avoid the development of an off-color on the metal surface.
5. Keep immersion times in **BLACK MAGIC® SS** as short as possible to achieve an acceptable black finish.

### EQUIPMENT

The Black Magic® tank should be constructed of mild steel. The cleaning and rinse tanks may also be constructed of mild steel. Acid pickling tanks should be plastic, rubber-lined steel or rigid polypropylene. Lead-lined tanks may also be used for the hot sulfuric acid and polypropylene tanks for the sulfamic acid solutions.

Gas heating units are preferred and should be under fired and insulated. Electric immersion units should be constructed of mild steel and also be insulated. For the hot sulfuric acid and QUICK PIK 1, quartz electric immersion heaters are recommended. 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® solution.

Hot alkaline cleaning, acid pickling and the Black Magic® 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.

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

### **CAUTION...THIS MATERIAL CONTAINS CAUSTIC SODA. CAUSES SEVERE BURNS.**

Do not get in eyes, on 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 reaction and spattering.** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. For eyes, call a physician.

### 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.