

Ultra-Blak™ 400-L

Black Oxide Finish for Steel

Ultra-Blak 400-L is a highly concentrated solution of **EPI's** oxidizing salt formulation containing a blend of activators, rectifiers, catalysts, penetrants and wetters. **Ultra-Blak 400-L** is recommended for black oxide installations where it is desired to automate the replenishment addition of the blackening salt solution through a pump and liquid level control system. It is also ideal for the initial charging of black oxide baths which will be replenished with **EPI's** conventional powdered **Ultra-Blak 400** salts. The **Ultra-Blak 400-L** finish meets military specification **MIL-DTL-13924E Class 1** as well as Aerospace Material Specification **AMS 2485L**.

The **Ultra-Blak 400-L** solution is operated at a temperature of 285°F to blacken a wide range of carbon steels, alloy steels and hardened tool steels. It will not blacken stainless steels which are readily blackened with **EPI's Ultra-Blak 407** or cast iron which is blackened with **Ultra-Blak 404**.

BATH MAKE-UP

A new bath is started by filling the tank with **Ultra-Blak 400-L** solution, as received, to within six inches from the top. Heat is applied and the solution is brought to a gentle rolling boil at approximately 275°F to 280°F. **Ultra-Blak 400-L** is used as a super-saturated solution and it should be allowed to boil for a while to evaporate some water and reach a boiling temperature of 285°F. Thereafter, the solution must be maintained at 285°F to 290°F for blackening steel. Maintain the proper working level in the tank by the addition of **Ultra-Blak 400-L** solution preferably by means of a metering pump directly from the shipping container. If **Ultra-Blak 400-L** solution is added manually, care should be taken to avoid too rapid an addition which could lead to spattering or an eruption on the surface. Allow the **Ultra-Blak 400-L** solution to slowly run down along a corner of the tank. If **Ultra-Blak 400-L** is added to the tank with a pump, it should be added above the surface, against the tank wall, through a pipe in a shielded corner. If the temperature of the solution climbs above 290°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 spattering and eruptions. If water is added manually, allow the water to run through a pipe down a corner of the tank. The corner should be covered with a mild steel shield extending diagonally across the corner from one side to the other side with the water inlet pipe passing through the shield and ending above the solution level and directed against the corner of the tank. **DO NOT INTRODUCE WATER BELOW THE SURFACE OF THE SOLUTION.**

It is recommended 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 over-heating 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. **EPI** can supply the automated temperature controller and water inlet valve with the preferred drilled piping to introduce the water along the rear wall of the tank above the solution level. Consult **EPI** for advice prior to installing a water inlet to a tank.

FINISHING PROCEDURE

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

1. Thoroughly clean and degrease pieces with **EPI's E-Kleen SR 196** Low caustic high temperature (210°F) (float oil), liquid **E-Kleen SR 102** (float oil) or liquid **E-Kleen SR 102-E** (emulsify oil). A typical cleaning time is five to ten minutes.
2. Rinse in bottom-fed, overflowing cold water rinse.
3. Immerse in **Ultra-Blak 400-L** solution (boiling at 285°F - 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 steel alloy and condition of the surface.
4. Rinse in bottom-fed, overflowing cold water rinse.
5. Seal the finish by immersing for one minute in **EPI's E-Tec 501** for an oily finish; **E-Tec 510** for a soft, dry film; or **E-Tec 520** for a hard, dry film.

Note: If the pieces to be blackened have scale or rust on the surface, it must be removed following cleaning and rinsing (Steps 1 and 2) in a 50% by volume Muriatic Acid solution or in an eight ounce to two pound per gallon solution of **E-Pik 215** dry acid salts. Rinse thoroughly with water following descaling and derusting.

OPERATING TIPS

Problems will rarely arise with a properly maintained and controlled **Ultra-Blak 400-L** solution. Most problems can be traced to insufficient cleaning of the work or an incorrect boiling temperature. Other tips would include:

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 solution 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 one pound of work per one-half gallon of solution. Optimum loads would be approximately one pound of work to one gallon of solution, including the weight of barrels, baskets and racks.

4. Operating the bath at temperatures approaching 300°F or over will cause the build-up of red iron oxide, which can cause a red smut or an off-color on the surface of the blackened parts.
5. The bath should be periodically desludged to remove accumulation of sodium carbonate, iron oxide and soils. In addition, the surface of the solution should be periodically skimmed with a dust-pan-type tool to remove hydrated iron oxide from the surface.
6. Transfer time from the **Ultra-Blak 400-L** bath to the rinse water should be as short as possible to avoid the development of an off-color on the metal surface.

A thorough final rinse after blackening will minimize contamination of the sealant solutions.

Equipment

The **Ultra-Blak 400-L** tank must be constructed of mild steel. The cleaning and rinse tanks may also be constructed of mild steel. Acid pickling tanks should be plastic or rubber-lined steel or rigid polypropylene.

Gas-heated tanks are preferred and should be underfired and insulated. Immersion electric units should be constructed of mild steel and also be 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 **Ultra-Blak 400-L** solution.

Your **EPI** representative will be pleased 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 **Ultra-Blak 400-L** solutions must be exhausted. The duct work may be of the same materials as recommended above for the tanks. Galvanized steel should not be used.

Notice: Before using this material, the **SAFETY DATA SHEET** for **Ultra-Blak 400-L** furnished by **EPI** must be read and the specific instructions and precautions followed to assure correct use and personal safety.

Please refer to the Ultra-Blak 400 Technical Data Sheet for additional information and instructions on the safe and correct operation of the process.

CAUTION-THIS MATERIAL CONTAINS CAUSTIC SODA. CAUSES SEVERE BURNS.

Avoid contact with eyes, skin and clothing. Do not take internally. When handling the solution and working near the bath, wear goggles or face shield, rubber gloves and rubber apron. While preparing solutions and making additions, take care 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.

Avoid contact of **Ultra-Blak 400-L** solutions with acidic materials.

DO NOT MIX Ultra-Blak 400-L solutions with any other chemicals or solutions.

IMPORTANT NOTICE! For Industrial Use Only

The following is made in lieu of all warranties, expressed or implied, including the implied warranties of merchantability and fitness for purpose: seller's and manufacturer's only obligation shall be to replace such quantity of the product as proved to be defective. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. **Neither seller nor manufacturer shall be liable either in tort or in contract for any loss or damage, direct, incidental or consequential, arising out of the use or the inability to use the product.**

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