

Is there a difference in the Tool Black® Liquid and Tool Black® Gel results?

No. The finish is identical in chemical composition when blackened with either Tool Black® Liquid or Tool Black® Gel.

What are the main differences between the Tool Black® Liquid and Tool Black® Gel?

Tool Black® Liquid is ideal for small parts that can be either immersed in the solution, or for use in touching up small areas on larger parts. Tool Black® Gel is intended for use on large areas of larger parts that cannot easily be immersed in a solution, or for fixed vertical areas, where a liquid solution would tend to run off.

Are the Tool Black® Liquid and Tool Black® Gel component parts interchangeable?

Yes, the Metal Polish Cleanser and Prevent® can be used with the original Tool Black® Liquid formula or with the Tool Black® Gel formula.

What steps are necessary to blacken a part with Precision Brand® Tool Black® Liquid?

Step 1 – Clean part thoroughly with Precision Brand® Metal Polisher/Cleanser. Rinse in clean water. Dry part and remove any excess sootiness. **Step 2** – Apply Precision Brand® Tool Black® Liquid by swabbing or dipping. The surface should turn black in seconds. Rinse in clean water. Dry quickly with forced air. **Step 3** – Spray part with Precision Brand® Prevent® to provide uniform non-greasy oil seal. Above three steps are shown in our on-line product catalog ([click here to view Tool Black® Blackening Process](#))

What ferrous metals will Tool Black® Liquid blacken?

Tool Black® Liquid reacts instantly with all non-stainless ferrous metals such as cast iron, forgings, all carbon, alloy steels and sintered metals. It will not blacken stainless steel.

Does the composition of the alloy affect the reaction?

Reactive alloys (cast irons, low carbon steels) blacken quickly and may even require diluting the Tool Black® Liquid to slow it down a bit. Higher alloys such as heat treatable grade or high speed steel blacken a bit more slowly and usually work with full strength Tool Black® Liquid.

What effect does hardening have on the blackening reaction?

Carbon steels will blacken readily up to a Rockwell C Hardness of 65. The chrome content of hardened tool steels will affect the reaction. Alloy steels with less than two percent chrome can be blackened up to and including Rockwell C Hardness of 65. Alloy steels with four percent or more chrome and hardened to 50-65 RC can be blackened with Tool Black® Liquid diluted with one part water to slow the blackening process. Harder materials, such as high speed steels, are less reactive and will blacken more slowly.

Does carburizing or nitriding affect blackening?

Yes, these treatments alter the surface and lower the amount of iron available for blackening. Consequently, they are much less reactive and may require bead blasting in order to form a dark, uniform black finish.

Will Tool Black® Liquid blacken zinc plate?

No, Tool Black® Liquid is designed for use on iron/steel surfaces only, not on plated surfaces or other metals.

What is the most important step in the Tool Black® Liquid blackening process?

CLEANING is most important step. Good quality blackening requires a clean reactive surface that is free of oil, oxide, rust and contaminants. All cutting and fabricating oils must be removed, along with all oxides such as heat treat scale, rust, mill scale, etc., Once the part is clean, the Tool Black® Liquid easily forms a uniform, adherent black finish.

Can alkaline cleaners be used?

Yes, if care is taken not to contaminate the mild acidic Tool Black® Liquid with alkaline cleaners. Residual cleaning compounds must be removed by rinsing thoroughly in water. Alkaline cleaners containing silicates are very difficult to rinse. Two overflowing bottom-fed rinse tanks or one rinse tank and a spray rinse are recommended. A mild acid rinse followed with an overflowing water rinse may be required after some alkaline cleaners. Low or silicate-free alkaline cleaners are easiest to rinse and may require only one rinse. Parts cleaned in alkaline cleaners should not be allowed to dry prior to rinsing. If they do dry, a hard-to-rinse silicate soap film is formed. The alkaline cleaning solutions should be maintained at the lowest recommended temperature to avoid parts drying before water rinsing. Length of immersion in the cleaners should be kept at a minimum. Precision Brand® Metal Polish/Cleanser is formulated for use with Tool Black® solution or gel. It removes all the common cutting oils and coolants and prepares the surface for blackening. Polish/Cleanser can be used as a brush-on cleaner, or mixed with water and used as an immersion soak cleaner. Always use fresh, unused solvent, for best results. If solvents are used more than once should be discarded frequently to avoid contamination problems. Always ventilate the work area when using these solvents.

What effect does alkaline contamination have on the Tool Black® Liquid?

It will rapidly devitalize the mildly acidic Tool Black® Liquid causing a reduction in depth of black, coverage and adhesion. A dry soap or silicate film left on the parts will cause a complete loss of adhesion.

Can I use other existing cold solvent cleaning solutions instead of the Precision Brand® Metal Polish/Cleanser?

Yes and no. Petroleum-based solvents cannot be used. Petroleum base solvents like mineral spirits, kerosene, etc., leave a residue that will hinder the blackening process. Chlorinated, alcohol, acetone or freon based solvents can be used. If you use these types of cleaning solvents, beware that these solvents may be contaminated from previous use. As solvents evaporate, oily contaminants do not evaporate and a thin film of oil is re-deposited on the part. This can be avoided by using multiple dips in the solvent, using one solvent solution to remove the majority of oil and a second, or even a third, to remove remaining traces. A cold detergent soak can also follow a solvent dip. The detergent cleaner will dissolve and suspend the soils which are left behind by the solvent. Then a final water rinse, after a detergent soak should remove the detergent and the suspended soils. Vapor degreasing can also be used. We recommend that you always use fresh, unused solvent, for best results. If solvents are used

more than once, they should be discarded frequently to avoid contamination problems. Always ventilate the work area when using these solvents. Two or three applications may be needed to completely degrease blind holes and recessed areas. Precision Brand® Metal Polish/Cleanser is formulated for use with Tool Black® Liquid. It removes all the common cutting oils and coolants and prepares the surface for blackening. Polish/Cleanser can be used as a brush-on cleaner, or mixed with water and used as an immersion soak cleaner.

Are there any other surface preparation steps?

Occasionally a consistent black coverage is not attainable due to surface scale. Bead blasting may be necessary to remove scale to achieve a uniform black surface. Occasionally, a uniform black finish is difficult to achieve due to the presence of oxides on the surface, in the form of rust, heat treat scale or mill scale. For best results, these oxides should be removed by bead blasting, to expose a uniformly active metal surface underneath. Once the surface is blasted, it is normally easy to form a uniform black finish.

Can I use a mild muriatic dip for surface preparation?

We do not recommend the use of muriatic acid because it can etch your part surface.

What do I do if I can't get a consistent black coverage on my part?

Odds are your part was not completely cleaned and oil-free before blackening. Repeat the cleaning and degreasing process and thoroughly rinse your part before blackening again. Bead blasting may be necessary to remove scale for a uniform black surface. Make sure you are following the directions exactly, forced air drying is also very important. If this still does not work, we'd recommend you read the rest of the "Frequently Asked Questions" regarding Tool Black® Liquid to see if there may be another possible problem.

Is there any benefit in heating the Tool Black® Liquid?

Tool Black® Liquid is formulated to be applied at room temperature and for most steels the room temperature process works great. Heating the product (to 130 degrees F max.) may help in the blackening of high speed steels.

Can hot parts be immersed in Tool Black® Liquid?

Normally, it is not recommended. The Tool Black® Liquid lasts longer if used on room temperature parts. Hot parts dip in the Tool Black® Liquid will devitalize your solution and shorten it's life by forming more spent chemicals quicker.

I store "used" Tool Black® Liquid in a separate container, what is the white precipitate or sludge which forms after several uses, and does it affect blackening?

The precipitate (iron phosphate) consists of by-products of the blackening reaction. The precipitate does not affect the blackening reaction or the life of the Tool Black® Liquid bath. The sludge should be allowed to settle to the bottom of the tank or container and periodically removed. Precipitate should not be stirred into the solution as it could settle on the black surface. Occasionally, the Tool Black® Liquid bath should be completely replaced. Never pour used Tool Black® Liquid back into the new, unused container. This would contaminate all of your Tool Black® Liquid.

What is the life of the Tool Black® Liquid?

Assuming the Tool Black® Liquid has not been contaminated by other chemicals and oils, the solution is depleted only through contact with metals. The solution will not lose strength if allowed to sit unattended or unused for long periods. The active chemicals will not evaporate. The time required to blacken will gradually increase as the active chemicals are consumed. They are replenished by adding fresh concentrate to the dilute working solution. The number of additions is limited only by the necessity for periodic tank/container clean-out to remove precipitate, sludge, foreign objects or contaminants. Tanks/containers contaminated with oils or alkaline cleaners should be dumped. An uncontaminated partially depleted solution removed from a tank or container during sludge removal could be saved and reused to dilute fresh concentrate when refilling the tank or container.

What is the life of the Metal Polisher/Cleanser solution?

The life of a cleaning and polishing solution depends upon the amount of contaminants from previous uses and how much oil it has absorbed. Oily contaminants do not evaporate and redeposit on your part during the cleaning process. Oil residue left on a part will hinder acquiring a uniform, adherent black finish. For optimum results, we would recommend not to reuse the polisher/cleanser solution to avoid the possibility of contamination. If you must reuse the polishing and cleansing solution, the best policy is to discard the solution as soon as it becomes noticeably dark and/or cloudy. Replacing the cleaner is usually less costly than re-working rejected parts.

What is the shelf-life of Prevent®?

The protection level and water-displacing properties of Prevent® will not deteriorate over time when stored in closed containers at moderate temperature. The aerosols in Prevent® may eventually go flat, but you can expect a minimum four-year shelf life for the aerosol when stored under moderate temperature.

What is the chemical composition of the black finish?

A crystalline deposit of cupric selenide.

Does the black penetrate the surface of the steel?

No, the blackening reaction takes place with the surface iron atoms, with no significant penetration or attack on the substrate.

How thick is the Tool Black® Liquid finish?

There is essentially no dimensional change with Tool Black® Liquid and, therefore, it is frequently used on cams, gauges, etc. The finish consists of a net build-up of about 30 millionths of an inch thick and usually regarded as non-dimensional in most applications.

Does Tool Black® Liquid impart any corrosion resistance to steel?

After using Tool Black® Liquid and sealing your part with Precision Brand® Prevent® rust preventive, the salt spray resistance will be about 80-120 hours. It is the absorption of the rust preventative by the porous black finish, which promotes the corrosion resistance. This is demonstrated by the fact that the

depth of black is enhanced after the rust preventative oil is absorbed by the crystal structure of the part's surface.

What is the abrasion resistance of Tool Black® Liquid?

The black finish is not regarded as a wear surface, but the overall durability is very good. The Tool Black® Liquid finish is used with excellent results on hand tools, cutting tools and other parts that are handled extensively. The optimum abrasion resistance of the Tool Black® Liquid finish is not developed until the finish has aged for 24 hours after application. The aging allows the crystalline finish to harden.

What is the scratch resistance of Tool Black® Liquid?

Excellent, because it reacts directly with the metal and will not chip or peel.

How hard is the Tool Black® Liquid finish?

Since it is a reaction with the surface, the finish is no harder than the base metal.

Does Tool Black® Liquid cause hydrogen embrittlement?

No, the solution is very mild, and the contact time is short. It is a porous finish and hydrogen can escape. There is no tendency for hydrogen embrittlement. Consequently, Tool Black® Liquid can be safely used on high load bearing alloys and critical surfaces with good results.

Does the Tool Black® Liquid finish conduct electricity?

Yes, the black finish is a conductor with a surface resistance of about 2 ohms per lineal inch. However, the conductivity may be affected by the Prevent® rust preventive topcoats.

Is the Tool Black® finish heat resistant?

Tool Black® Liquid withstands heat very well because it is a completely inorganic finish. The black finish itself can withstand temperatures up to 1200 degrees F. The crystalline finish itself will show some color change to a purple cast at very high temperatures. Most of the color change will take place in the base metal, which will develop heat distortion lines, or a mottled effect which shows through the thin Tool Black® Liquid finish.

Tool Black® Liquid exhibits **excellent** color retention up to 350 degrees F and **good** color retention up to 600 degrees F.

The Prevent® rust preventive will usually begin to decompose at 400-500 degrees F.

What is the interior durability of Tool Black®?

The application of Precision Brand® Prevent®/Dri-Shield™ over Tool Black® Liquid will produce excellent corrosion resistance. Parts protected with this preventive will exhibit excellent resistance to humidity and condensing water and may be stored or used in an interior environment, long term, without deterioration.

What is the exterior durability of Tool Black® Liquid?

Tool Black® Liquid finishes are not recommended for long-term outdoor exposure as the rust preventive will be removed by the weather elements. To prevent deterioration, the black finish should be sealed with a clear acrylic lacquer.

What is the chemical resistance of Tool Black® Liquid?

It has excellent resistance to all solvents, gasoline, lubricating oils, cutting oils, coolants and hydraulic fluids. It has good resistance to mild acids and is superior to the hot oxide finishes in acid resistance.

How much tool area can I expect to blacken with one pint of Tool Black® Liquid?

One pint of Tool Black® Liquid contains enough chemistry to blacken 25-30 square feet of surface area, however coverage varies with application technique. The solution will not deteriorate when stored in a closed container, but will slowly become weaker as parts are blackened in it, and the reaction will slow down. Adding fresh concentrate will restore the strength of the working solution.

How do I remove Tool Black® Liquid once it has been adhered to the tool surface?

The Tool Black® Liquid finish is best removed by bead blasting the surface, or by other abrasive methods such as steel wool or sandpaper.

Upon completion of the 3 step blackening process, done step by step correctly, the black finish wipes away completely with a shop rag from my 1018 steel parts, what am I do wrong?

Odds are your parts may not be completely clean and free from oil & scale before blackening or you are over-processing the parts in the Tool Black® Liquid.

First, there is a possibility that the oil or scale on your parts are not being removed with the Precision Brand® Metal Polish/Cleanser (P-C). The P-C removes a majority of oils and scale, however, some parts may require a stronger cleaning process. Your parts may require a different P-C product. Without knowing the exact properties of the oil on your parts we cannot recommend a specific P-C. You may also try different cleaning techniques with the Precision Brand® Metal Polish/Cleanser. You can try soaking your part in the P-C. You can also try using warm water mixed with the P-C. Or lastly try agitating the P-C solution and scrubbing the surface of the parts with the P-C solution. In some extreme cases bead blasting may be necessary to remove scale and oils for a permanent uniform black surface. Whichever polishing/cleansing process you use, it is very important to make sure your parts are completely rinsed and all the polishing/cleansing solution is removed before blackening.

Second, if the parts are free from scale and oil, there is a possibility of over-processing the Tool Black® Liquid. Once the Tool Black® Liquid is applied to the surface, you want to give it enough time to react completely, but not overdo it. The Tool Black® Liquid is a fairly aggressive solution. If given way more time than necessary, the liquid can actually undermine the coating it has just deposited, resulting in almost total loss of adhesion. Normally, a clean 1018 part should blacken in less than 20 seconds. If the contact time was over 2 minutes, you may see large amounts of black rub off. If the contact time is over 3 or 4 minutes, you could see outright loss of adhesion, down to the bare steel.

The 1018 is a fairly reactive alloy. Some folks get better results by diluting the Tool Black® Liquid a bit to tone it down, and allow more latitude on the time aspect. Try cutting the Tool Black® Liquid to 1:1 with water for openers or more if the reaction is still very fast.

What is the maximum temperature Tool Black® Liquid can withstand after being applied?

Tool Black® Liquid coating exhibits “excellent” color retention up to 350 degrees F and “good” retention up to 600 degrees F

Is Tool Black® Liquid water based?

Yes

Is Tool Black® Liquid safer than black oxide or anodizing?

The Tool Black® Liquid process is safer and faster than the “Hot Black Oxide” process.

Can Tool Black® Liquid be painted over?

Yes.

How do I avoid flash corrosion when rinsing off Tool Black?

It is essential to use some type of water rinse/spray application following the use of Tool Black—the solution is acidic, and contains metal components that will continue to react with the base metal of the piece being blackened if these residues are not removed. If looking for a way to inhibit the flash corrosion that often occurs as the blackened part dries, it is helpful to add a small amount of baking soda to the rinse water (approximately 1 teaspoon/gallon) in order to make the rinse water slightly alkaline, which will help to neutralize the acidic residues from the Tool Black solution and temporarily provide limited corrosion protection.