

## and Screen Print Clear VI0402

### Quick Links

[3M Graphics Warranties](#)  
[Technical Information Selector](#)  
[Safety Data Sheets \(SDS\)](#)  
[Videos](#)

Some of these links lead to web-based resources that are not product-specific.

## Product Description

- Opaque, fast-drying ink
- Available in line ink and four color ink.
- Formulated for use on selected 3M graphic films

## Product Features

- Weather resistant
- Excellent color retention
- Superior exterior performance on difficult application surfaces, including corrugated and riveted surfaces
- Metallic flakes may be added to the line color inks
- Lead-free materials are available

### **i** IMPORTANT NOTE

Pigments in 3M™ Four Color Screen Printing Ink Series 1900 may be slightly different from those in 3M™ Four Color Screen Printing UV Ink Series 9800. Adjustments may be needed in four color separation.

## Recommended Types of Graphics and End Uses

Refer to the base film or flexible substrate's 3M Product Bulletin for details on specific constructions and any warranty that may apply when using this product.

- For multicolor graphics
- For graphics applied to flat or corrugated surfaces, with and without rivets
- 1920DR recommended for use on transit-mix cement trucks or other vehicles frequently washed with concentrated, strong acids or aluminum brighteners.

## Product Line

### Half Tone Concentrates and Bases

Halftone Concentrates		Halftone Bases	
1990	Yellow	1997	Standard
1991	Magenta	1998	Retarder
1995	Black		
1996	Cyan		

### Line Color Opaque Ink

1902 <sup>1</sup>	Red Shade Yellow	1927	Blue Violet
1903	White	1932 <sup>2</sup>	Lemon Yellow
1905	Black	1933 <sup>1</sup>	Orange
1912 <sup>1</sup>	Green Shade Yellow	1937	Red Violet

# Screen Printing Ink Series 1900

<b>1913<sup>2</sup></b>	Red Shade Orange	<b>1952</b>	Transparent Red Shade Yellow
<b>1914</b>	Dark Green	<b>1967</b>	Magenta
<b>1916</b>	Green Shade Blue	<b>1970</b>	Red Shade Blue
<b>1918</b>	Yellow Shade Red	<b>1971</b>	Deep Red
<b>1924</b>	Light Green	<b>1972</b>	Transparent Green Shade Yellow

1. These products have lead-containing pigments: 1902, 1912, 1933.
2. Line colors 1913 and 1932 can be used to develop lead-free formulas.

## Screen Print Clear

Liquid Clear Coats	
<b>1920DR</b>	Dirt Resistant Screen Print Clear
<b>1930</b>	Matte Screen Print Clear
<b>VI0402</b>	Petroleum Resistant Clear <sup>1</sup>

1. For graphics used where frequent petroleum spills occur, we recommend using clear VI0402.

## Toner/Reducer

<b>1910</b>	Gloss Toner/Reducer
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## 3M™ Thinners

For Inks or Concentrates	For Clears
<b>CGS-30</b>	<b>CGS-30</b>
<b>CGS-50</b>	<b>CGS-50</b>
<b>CGS-80</b>	

NOTE: The higher the CGS number, the slower the evaporation rate.

## Recommended Compatible Products

Always refer to the most current Product Bulletin at [www.3Mgraphics.com/TechInfo](http://www.3Mgraphics.com/TechInfo) for the 3M films you are using for complete details, including ink compatibility and specific recommendations.

## Graphic Materials

Ink series 9800 is compatible with most of 3M's Scotchcal, Controltac and Scotchlite branded graphic films that are designed for screen printing.

## Graphic Protection

- [3M™ Screen Print Matte Clear 1930](#)
- [3M™ Screen Print Gloss Clear 1920DR](#)
- [3M™ Screen Print UV Gloss Clear 9740i](#)

## Application Tapes

See [3M Instruction Bulletin AT-1](#) to determine what application tape is recommend for your film or finished graphic.

## Warranty Information

### Warranty Coverage Overview

The warranty coverage for eligible graphics is based on the user both reading and following all applicable and current 3M Graphics Product and Instruction Bulletins. The warranty period for eligible graphics is as stated in the 3M Graphics Warranties Matrices at the time that the film was purchased. Information found at [3Mgraphics.com/warranties](http://3Mgraphics.com/warranties) includes:

- [3M Graphics Warranties Bulletin](#)
  - This bulletin contains information on limitations and exceptions, and warranty period reductions for 3M Graphics Warranties. The warranty period may be reduced and stipulations may apply for certain constructions and applications, as covered in this Bulletin.
- [3M Graphics Warranties Selector](#)
  - Use this selector to search for your warranty period by product number, ink type, and ink/printer platform.
- [U.S. Desert Southwest Region Map](#)
  - Use this map of hot, arid desert areas to determine if you are subject to reduced warranted durabilities.

The warranties set forth in this Bulletin are made in lieu of all other express or implied warranties, including any implied warranty of merchantability, fitness for a particular purpose, or arising out of a course of dealing, custom, or usage of trade.

### 3M Basic Product Warranty

3M Graphics Products are warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in its applicable 3M Graphics Product Bulletin and as further set forth in the [3M Graphics Warranties Bulletin](#).

### Limited Remedy

The limited remedy applicable to each warranty is addressed in the 3M Graphics Warranties Bulletin found at [3MGraphics.com/warranties](http://3MGraphics.com/warranties).

### Limitation of Liability

Except to the extent prohibited by law, 3M SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO PURCHASER OR USER FOR ANY DIRECT (EXCEPT FOR THE LIMITED REMEDY PROVIDED HEREIN), INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LABOR, NON-3M MATERIAL CHARGES, LOSS OF PROFITS, REVENUE, BUSINESS, OPPORTUNITY, OR GOODWILL) RESULTING FROM OR IN ANY WAY RELATED TO 3M'S GRAPHICS PRODUCTS, SERVICES, OR THIS BULLETIN. This limitation of liability applies regardless of the legal or equitable theory under which such losses or damages are sought.

### Warranty Period Matrices

See the 3M Graphics Warranties Matrices at [3MGraphics.com/warranties](http://3MGraphics.com/warranties), for warranty period information specific to your film.

### Additional Limitations

#### Graphics Exposed to Abrasion or Staining

Graphics are not warranted against fading, cracking, peeling, lifting or discoloration due to severe abrasion or staining from cleaning solutions, engine fuels, exhaust, or organic solvents.

#### Color Matching Ink to Film

If the color of a printed ink is matched to the color of a pigmented film, the finished ink and film may not maintain the same color or gloss after being exposed outdoors.

See the 3M Graphics Warranties Bulletin at [3MGraphics.com/warranties](http://3MGraphics.com/warranties), for terms, additional limitations of your warranty, if any, information on reduced warranties for different exposures, and limitations of liability.

## Health and Safety

### CAUTION

When handling any chemical products, read the manufacturers' container labels and the Safety Data Sheets (SDS) for important health, safety and environmental information. To obtain SDS sheets for 3M products go to [3M.com/SDS](http://3M.com/SDS), or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

## Ventilation

Provide local and/or general exhaust ventilation in the print production areas to prevent a build up of ink vapors and to maintain levels below the limit for worker exposure. An experienced industrial ventilation engineer and/or a certified industrial hygienist can help evaluate your ventilation requirements and design based on your onsite process conditions.

Please refer to the printer manufacturer's literature for additional details and requirements.

## Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

## More on Environmental Health and Safety

Additional environmental, health, and safety information is available on our website at [3Mgraphics.com/sustainability](http://3Mgraphics.com/sustainability).

## Graphic Performance Life

The actual performance life of a graphic is affected by all of the following. Additional performance considerations may be provided in the base film Product Bulletin.

- A clear is required for graphics printed with ink series 1900.
- Custom formulations containing 3M screen printing ink series 1900 with Scotchlite ink series 2900 void the warranty.
- If the color of a printed ink is matched to the color of a pigmented film, the finished ink and film may not maintain the same color or gloss after being exposed outdoors.
- Clears 1920DR and 1930 can be mixed to obtain a custom gloss. Any Warranty Periods offered will be equivalent to the least durable component used in the construction, in this case, clear 1930.

## Sheet Preparation

### Scotchlite Reflective Graphic Film

3M™ Scotchlite™ Transparent Screen Printing Ink Series 2900, which is transparent ink, is the recommended ink to use. Ink Series 1900 can be used but most of the inks are opaque, will not transmit light and will appear black at night.

### Liner Printing

- Polyethylene-coated paper liner; this type of liner cannot be printed.
- Kraft paper liner: this type of liner can be printed. Print the liner before screen printing the graphic. Use a fast drying lacquer or a fast drying halftone black screen printing ink for paper.

## Clear Preparation and Coverage Mixing, Toning, and Thinning Ink Series 1900

### Line Colors

- The line colors from ink series 1900 typically need 10 to 20% thinner added to reach the desired viscosity of 1500 to 2000 centipoise.
- Under typical conditions with line inks thinned to print viscosity and using a 230 tpi (threads per inch) mesh screen, the approximate coverage is one gallon per 1600 square feet (3.8 liters per 39 square meters).

### Four Color Inks

- Four color inks in ink series 1900 are supplied as concentrates. The concentrates must be mixed with a halftone base and thinner to be made press ready. A typical press-ready formula for four color ink is 20% ink concentrate, 70% halftone base and 10% thinner formula by weight.
- Under typical conditions with press-ready ink and using a 280 tpi (threads per inch) mesh screen the approximate coverage is:
  - Solid (100%) printing: one gallon per 1800 square feet (3.8 liters per 44 square meters).
  - 50% dot coverage: one gallon per 3600 square feet (3.8 liter per 88 square meters).

### Screen Print Clear

- Clears 1920DR and 1930 typically need 20 to 30% thinner added to reach the desired viscosity of 600 to 900 centipoise. Using a 200 tpi mesh screen, the approximate coverage is one gallon per 2500 square feet (3.8 liters per 61 square meters).
- The process must produce the 3M recommended coating thickness of 6-12 microns in all areas of the graphic. If the coating is too thin, it will not have the expected durability; if too thick, the coating will reduce the film's ability to stretch and conform.

### Petroleum Resistant Graphics

- Use clear VI0402 to improve the graphic's resistance to petroleum staining on products such as film 3650-10 white.
- Clear VI0402 typically needs approximately 30% thinner CGS-80 added to reach the desired viscosity of 800-1000 cps.
- Using a 230 tpi mesh screen, the approximate coverage is one gallon per 4500 square feet (3.8 liter per 36 square meters).
- Air dry the clear and then follow by oven drying.
- See [3M Instruction Bulletin 3.12](#) for more detailed information.

### Roller Coating

3M does not recommend or endorse a specific roll coater, nor does 3M make specific recommendations on how to make the clears more suitable for roll coating. These are high viscosity solutions that require appropriate handling equipment, and may require adjustments to flow properly. Do not thin the clear coat or add any components (such as flow agents) that have not been approved by 3M.

### Application and Installation

In addition to other 3M Bulletins specified in this document, the following Bulletins provide details that you may need to successfully apply a graphic.

- [3M Instruction Bulletin 3.11](#). Screen Printing, 3M™ Screen Printing Ink Series 1900 four color and Screen Print Clear VI0402.
- [3M Instruction Bulletin 4.1](#). Sheeting, Scoring and Film Cutting.
- [3M Instruction Bulletin 5.1](#). Select and Prepare Substrates for Graphic Application
- [3M Instruction Bulletin 5.36](#). Application Techniques for Automobiles, Vans and Buses. Complete the 3M Pre-Installation Inspection Record found in this Instruction Bulletin prior to manufacturing or applying a graphic to an automobile, van, or bus.
- [3M Instruction Bulletin 5.4](#). Application, Fleet Trucks.
- [3M Instruction Bulletin 5.45](#). Application Techniques for Railcars.
- [3M Instruction Bulletin 6.5](#). Storage, Handling, Maintenance, and Removal of Films and Sheatings.
- [3M Product & Instruction Bulletin UV Clears](#). Screen Print UV Gloss Clear 9740i, Screen Print Matte Clear 9730UV

## Special Applications

### Transparent Ink Series 2900

Transparent ink series 2900 can be printed over or under ink series 1900.

### Digital Inks

Clear 1920DR is approved for use on many warranted digital graphics. Refer to the base film's 3M Product Bulletin for details.

### Metallic Flakes for Use with Line Colors

Metallic flakes are for use only with ink series 1900 line colors.

Producing graphics with inks that contain metallic flakes requires careful attention to produce consistent, high quality graphics. Even small changes in components and processing conditions affect the print quality. See [3M Instruction Bulletin 3.12](#).

### Warranted Metallic Flakes

We recommend only Sparkle Silvex® Aluminum Flakes. Other flakes may not be outdoor durable.

- Small flakes 5000 AR
- Medium flakes 3000 AR

#### IMPORTANT NOTE

Sparkle Silvex is available from:  
Siberline Manufacturing Company, Inc.  
130 Lincoln Drive, P.O. Box B  
Tamaqua, PA 18252  
Telephone: 800-348-4824  
Fax: 570-668-0197  
[www.silberline.com](http://www.silberline.com)

### Flake Concentrations

Type	Maximum Concentration by % Weight	Typical Concentration by % Weight
Metallic Flakes	8	5 to 8

### Screen Printing with Flakes

- Use the same screen printing and drying methods for metallic ink as for line colors in ink series 1900.
- Inks must be protected with a clear coat.

#### IMPORTANT NOTE

Metallic flakes require special handling. Exposure to air causes them to deteriorate and agglomerate. This will cause printing problems. We recommend buying only what can be used in a short period of time. See [3M Instruction Bulletin 3.20](#) for details.

## Drying: Ink and Screen Print Clear

Drying Method	Minimum Temperature	Minimum Time
Air	Ambient	24 hours
Batch	150 °F (64 °C)	2 hours
Conveyor <sup>1</sup>	150 °F (64 °C)	30 seconds

1. Conveyor drying is recommended. Check the conveyor temperature at various locations across the belt.

Note: Drying tests are provided in the ink Instruction Bulletins.

## Application Tapes

After the graphics are thoroughly dry, you should apply a prespace tape or premask tape using a roll applicator. Do not use heat.

There are two types of application tapes. See [3M Instruction Bulletin AT-1](#) to determine what application tape is recommend for your film or finished graphic.

### Premasking Tape

Increases stiffness during application while preventing stretching and damage. Use when little or no liner is exposed. See [3M Instruction Bulletin 4.3](#) for complete details.

### Prespacing Tape

Holds cut and weeded letters or graphics in place during application and after removing the film liner, while preventing stretching and damage. Use when large amounts of liner are exposed. See [3M Instruction Bulletin 4.3](#) for complete details.

## Shelf Life, Storage and Shipping

### Shelf Life

Use by the expiration date shown on the product packaging. A Use By Date, such as 01Dec2014, is on the ink container product label, as well as the outer shipping carton. Do not use ink that shows signs of gelling.

### Ink Storage Conditions

- Store the inks at 32 to 80 °F (0 to 27 °C).
- Store the inks in the original container or in other similar containers.
- Do not use ink that shows signs of gelling.

### Shipping Finished Graphics

Refer to the base media's 3M Product Bulletin.

### Shipping Ink

The inks are non-regulated when transported via ground. Opened ink boxes and bags may no longer provide adequate protection against leaks and spills. Exercise caution when shipping opened boxes or bags to ensure prevention of spills or leaks. In the United States, refer to the SDS for further information.

## Bulletin Change Summary

For the most current 3M Technical Information available to successfully use this product, please view this Bulletin electronically and click on the blue underlined links to view the relevant documents. This Bulletin has been substantially changed. Please read the entire Bulletin thoroughly.

### Rev Q JULY-2015:

- Updated Product Bulletin to new format.

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