

Product Description

- For Inkjet Printed or Screen Printed Graphics
- High-performance, ultraviolet-cured clear coat for use on most 3M brand graphic films
- Screen Print UV Gloss Clear 9740i is designed for use on 9800 and 1900 screen print inks, and most Solvent and UV-cured piezo inks.

NOTE: Check the 3M™ MCST™ Warranty and 3M Performance Guarantee matrices for specific ink recommendations and warranted applications for 9740i at 3Mgraphics.com/warranties. 9740i is not recommended for use on latex or most "Ecosol" inkjet inks.

- Screen Print Matte Clear 9730UV is designed for use on 9800 and 1900 screen print inks. It is not warranted for use on digital inkjet inks.

Product Features

- Weather-resistant
- Tough, flexible, chemical-resistant and abrasion-resistant

Recommended Types of Graphics and End Uses

- Indoor and outdoor graphics on flat, corrugated and/or riveted applications
- For graphics used in a petroleum environment where staining is not a concern

Characteristics

These are typical values. Processing may change the values.

Performance Characteristics

| Characteristic | Value |
|----------------------------------|---|
| Gloss | 9740i: typical value is 85-90 gloss units (60 degree gloss) when coated on smooth film or inks. Gloss over rough surfaces like most UV-cured piezo inks will be lower. 9730UV: typical value is 25-40 gloss units (60 degree gloss) when coated on smooth film or inks. Thicker coatings of 9730 will generally have higher gloss than thinner coatings. |
| Recommended Coating Thickness | 6 to 12 microns |
| Typical Coverage per U.S. gallon | 2500-5000 ft ² |

Warranty Information

All 3M graphic protection products are covered by the 3M Basic Product Warranty.

A warranty period may be offered based on the graphic construction and application details. Always refer to the 3M Product Bulletin for the 3M base film or flexible substrate you are using to determine if the graphic protection product you want to use is recommended and what, if any warranty period is offered.

IMPORTANT NOTE

Warranty information including limitations and exceptions and warranty periods for this product can be found at 3Mgraphics.com/warranties.

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.

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 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, and graphic exposures as covered in this Bulletin.
- [3M Graphics Warranties Selector](#)
 - Use this selector to search for your vertical 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.

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, for vertical warranty period information specific to your film.

Additional Limitations

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

Blending Clears

Clears 9730UV and 9740i can be blended to achieve a custom gloss for use over 3M™ Screen Printing UV Ink Series 9800. If you blend these clears, the warranty is the same as for clear 9730UV.

Health and Safety

WARNING

Observe safe operating procedures when using UV cured clears. Provide adequate ventilation and wear appropriate gloves and other protective clothing to avoid all skin contact. Refer to the Safety Data Sheets (SDS) for details.

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, 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.

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.

Factors that Affect Graphic Performance Life

The actual performance life of a graphic is affected by:

- the combinations of graphics materials used.
- complete ink drying or curing.
- selection, condition and preparation of the substrate.
- surface texture.
- application methods.
- angle and direction of sun exposure.
- environmental conditions.
- cleaning or maintenance methods.

Graphics Manufacturing

CAUTION

Before using any equipment, always read the manufacturer's instructions for safe operation.

Application Tapes

There are two types of application tapes. See [3M Instruction Bulletin AT-1](#) to determine what application tape is recommended 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.

Additional Instructions

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 4.22](#) Lamination Basics for Inkjet Printed Graphics

IMPORTANT NOTE

To achieve the highest clear coat adhesion, apply the clear within 3 days after printing.

Considerations for Printing Graphics

UV-Cured Piezo Ink

When printing with UV-cured piezo ink, the ink may need to be cured at or slightly below the minimum recommended cure dose in order to get adequate adhesion of the clear. Keep in mind that the ink will receive an additional cure dose as the UV clear is processed. The ink cure dose does not need to be high enough so that the ink does not block or transfer when rolled up after printing. Refer to the 3M Product & Instruction Bulletin for the 3M ink you are using for general curing dose recommendations.

Digital Solvent Ink

IMPORTANT NOTE

Incomplete drying or curing can result in graphic failure including curling, increased shrinkage and adhesion failure, which are not covered under any 3M Graphic Warranty.

See the ink's 3M Product and Instruction Bulletin for more details.

For images with a heavy solvent ink laydown to which a UV clear coat is applied, additional limiting of total ink coverage and/or additional drying time may be needed. The following test helps determine the maximum possible ink laydown and/or adequate drying to ensure that a UV clear coat is successfully applied.

1. Print a test image.
 - a. Use the film and ink and image you plan to use for production.
 - b. Use a range of total ink coverage percentages.
 - c. Use the proper printer production default settings that are optimum for the film and image you are printing.
2. Apply the UV clear.
 - a. If the clear-coated surface blisters or has low gloss while curing the UV clear, it is probably due to excess solvent from the inks still retained in the film. The range of ink laydowns in the test will show at what point the blistering starts.
 - b. Check to be sure that the clear is not excessively tacky.
3. Reduce retained solvent.
 - a. **Preferred method:** Reduce the total ink coverage by using ink-limiting features in the image processing software.
 - b. Optional method: Evaporate the solvent more thoroughly by using options available for your printer (if any). This may include running the film through the dryer multiple times, increasing dryer temperature, rack drying over an extended period, etc.
4. If blistering or gloss loss still occurs, cure at the lower end of the cure level spectrum. See below.

Screen Print UV Ink Series 9800

Cure the ink at the lowest possible setting to ensure that it or the film is not over cured. Excessive UV exposure during printing can prevent the clear from adhering properly.

Printing with 6 or more colors

Multi-pass, screen print jobs that use 6 or more colors should be checked carefully to ensure the film and printed colors have not been overexposed leading to poor clearcoat adhesion. See "Tape Snap Adhesion Test" on page 8 for details on how to test for overexposure.

Screen Print Solvent Ink Series 1900

If the image has heavy solvent ink laydown, further ink limiting and/or additional drying may be needed to avoid solvent blistering during the UV curing process for the clear.

Preparing the Clear

Typical Coverage

Typically, 1 U.S. gallon (3.8 liters) of the clear covers 2500 to 5000 square feet (59 to 83 square m/l) with a 380 plain weave mesh. However, several elements affect the coverage:

- Screen mesh and type
- Hardness (durometer) of the squeegee. See "Fabric" on page 6.
- Angle of the squeegee
- Emulsion thickness

Mixing

Mix the screen print clear for a minimum of 10 minutes to get an even distribution of all components. Some separation of the components is normal during storage.

Use a high-speed power mixer with a blade 1/3 to 1/2 the size of the container. If the blade is smaller than this, make sure to move it around in the container. Put the blade 2/3 of the way into the liquid.

A paint shaker can also be used. Mix for 15 to 20 minutes.

IMPORTANT NOTE

If using the same container for more than 8 hours, the clear should be remixed to ensure an even distribution of all components.

Applying the Clear

Frame

- Use a rigid, metal frame.
- Include a 6 to 10 inch (15 to 25 cm) well between the frame and the graphic design on all sides.

Fabric

Fabric selection is critical. Choose a fabric that lays the clear to a thickness of 6 to 12 microns. Dynamesh, Saati and Tetko companies all make suitable fabrics.

- Use a monofilament thread, plain weave fabric.
- Use a PE355 to PE380 (140 to 165 threads per cm) or any fabric that maintains a theoretical ink volume of 0.35 to 0.69 cubic inches/square yard (7 to 13.5 cm³/m²) and thus will produce a clear thickness of 6 to 12 microns. A thicker screen print clear coating produces a smoother and glossier graphic, but the thicker clear layer will be harder to cure and may require a higher curing intensity. See also important note below.
- Use a thread with a diameter of 31 or 34 microns. The total fabric thickness should be less than 50 microns.

IMPORTANT NOTE

Thicker clear coats may reduce the flexibility and extensibility of the graphic construction, leading to problems such as cracking around rivets or excessive film tearing during removal (where applicable).

IMPORTANT NOTE

Calendared fabrics, twill weaves and thick threads affect the ink lay down and cause printing and curing problems.

Stencil

Use a photographic or hand-cut stencil that is water soluble and resistant to ketones and strong lacquer solvents.

Squeegee

Multiple durometer squeegee (70/90, 65/95/65, 70/90/70, or 75/95/75) provide the best results. A sharp squeegee with an 80 durometer or harder plastic blade will also work.

IMPORTANT NOTE

A softer squeegee increases the clear lay down and can make printing more difficult.

Use a squeegee large enough to overlap the design by at least 2 inches (5 cm) on each side.

Set the squeegee angle to as near vertical as possible. Do not let the angle to the horizontal be less than 80 degrees. The exact angle may vary because of press design.

IMPORTANT NOTE

A lower angle may result in a heavy clear lay down. This may cause curing problems.

Screen Printing Method

Use the off-contact screen printing method to produce a uniform impression. Make a fill pass and then make the impression pass.

Roller Coating Method

Use of roller coating is not recommended or warranted by 3M.

Curing Methods

CAUTION

Before using any equipment, always read the manufacturer's instructions for safe operation.

About Curing

- Best results are obtained by curing immediately after screening. Placing the sheets in a drying rack or delaying the curing process may cause an undesirable surface appearance.
- Using the curing ranges specified ensures proper curing. Too low of an energy level may result in a wet and tacky print. If lamp intensity is too low (below 600mW/cm² in the UVA band) the clear may cure with a matte finish especially over dark films or dark ink areas.
- Too high a cure energy may lead to blistering of underlying ink, excessive yellowing of the clear, or embrittlement of the clear.
- High substrate temperatures associated with the UV curing process may cause a decrease in gloss due to residual solvent coming out of the inkjet printed film. This effect will be most noticeable in darker, heavy ink laydown areas. The effect can be minimized by reducing the amount of ink laydown and reducing heat generated during curing.
- If there is still blistering after minimizing the amount of retained solvent during printing, try the following:
 - a. Reduce the base film temperature during curing such as by increasing ventilation in the curing unit.
 - b. Reduce the cure dose to the lower level of the range found in Table A on page 8.
 - c. Run at a higher belt speed during the curing process (at the same overall dose).

Example: A lamp intensity of 300 watt/in with a belt speed of 150 ft/min to give a UVA cure dose of 175 mj/cm² would be preferred over a setting of 200 watt/in lamp intensity with a belt speed of 100 ft/min that also gives a UVA cure dose of 175 mj/cm².

Color of the Printed Clear

The clears when printed have a slightly yellow tint that increases as the cure dose used to cure the clear increases and/or the amount of heat the graphic is exposed to increases. Exposing the graphic to outdoor ultraviolet light will photo-bleach most of the tint within a few days. Fluorescent light will also photo-bleach most of the tint, but it will take a longer period of time.

The color of the clear in the container can also vary. See "Shelf Life, Storage and Shipping" on page 9.

Focused-lamp Curing Unit

Focused-lamp cure units use high concentrations of ultraviolet light to initiate polymerization.

Specifications

- Use a medium pressure mercury lamp that has an energy output of at least 200 watts per inch (wpi) or 80 watts per cm. If using lower wattage bulbs and slower speeds, there is a risk of generating too much heat and causing a gloss change and/or blistering.
- Bulbs must have adequate energy in the 230-350 nm range to cure the clear correctly. Output intensity in the UVC band should be about 1/6 of the output intensity in the UVA band.
- Bulbs need to produce a minimum UV Peak irradiance of 600 milliwatts/cm² in the UVA band.
- Do not use ozone-free or doped bulbs. These bulbs may not produce the correct wavelengths to properly cure the clear. Some quartz IR filters can also interfere with the cure.
- The UV energy output of the cure unit must be accurately measured. Use a Uvicure[®] Plus II UVA/High Power model. The Multiband Power Puck II unit can also be used and will allow you to also check UVC band output. This radiometer is available from: EIT Corporation, 108 Carpenter Drive, Sterling, VA 22170. Telephone: (703) 478-0700.
- The energy levels should be uniform across the entire web. Energy levels could be significantly lower at the web edges. Do not clear coat graphics that are wider than the width of the uniform output of the lamps.

Operation

1. Measure the UV lamp energy and irradiance levels at the beginning of every working day and whenever adjustments are made to the unit.
2. Allow the lamps to heat up for at least 10 minutes or until the indicators show that the lamps have stabilized.
3. Replace bulbs according to the bulb manufacturer's recommendations. Dirty lamps and reflectors or bent reflectors prevent the ink from curing properly.
4. Adjust the lamp wattage and/or belt speed to get the specific energy level on the radiometer while maintaining the minimum peak irradiance or intensity. These are the recommended cure levels for the Uvicure[®] Plus Radiometer (measured in UVA band):

Table A. Calibration Standard for Uvicure® Plus Radiometer (mJ/cm²)*

| Clear | Graphic Type | Target | Range |
|--------|--------------------------|--------|------------|
| 9730UV | Digital | 260 | 150 to 310 |
| 9730UV | Screen Print | 280 | 250 to 310 |
| 9740i | Digital and Screen Print | 200 | 150 to 250 |

*Radiometer measures in joules/cm². To convert, 0.045 joules/cm² equals 45mJ/cm².

5. Test the clear to make sure that it is properly cured. Test methods are outlined in "Testing" on page 8.
6. Adjust the unit until the clear is correctly cured.

Testing

Maintain a testing log for future reference. Clear coating must pass these 2 tests:

- Appearance Test
- Tape Snap Adhesion Test

Appearance Test

These are the surface characteristics of properly cured UV Clear.

- High gloss (for 9740i when coated over smooth surfaces)
- No wet or tacky areas
- Does not surface impress once sheets are cool

Tape Snap Adhesion Test

The Tape Snap Adhesion Test determines if the clear is over-cured or if the film or ink has been overexposed or over-cured. It tests the adhesion of the clear to ink and the adhesion of the clear to the film.

Frequency

Be sure to conduct this test daily on all printed colors and on unprinted areas of the film.

Procedure

1. From the start of the print run, set aside enough production material to test the clear. You can also use misprinted material produced during the print run.
2. Print the clear on the test material.
3. Cure at the level for the screen print clear.
4. Use the point of a sharp razor blade, knife or other suitable instrument to scratch at an angle a crosshatched pattern through the clear. Do not cut into the film. Be sure to scratch areas where the clear is applied over printed ink and film.
5. Use 3M™ Hand Applicator PA-1 to firmly apply a 1-inch wide strip of Scotch™ Tape #610 over the crosshatched areas.
6. Remove the tape by pulling it back upon itself (180°) using a rapid, firm pull.
7. No separation should occur between the clear and the inks or between the clear and the film.
8. If the layers separate, so that the clearcoat or clearcoat and ink is pulled off with the tape, then decrease the cure dose of the clearcoat by increasing the belt speed slightly.

IMPORTANT NOTE

The clear must still pass the Appearance Test after making any adjustments.

9. Repeat steps 1 through 8 until a sample passes the Adhesion Test.

10. If you have made adjustments and still cannot get the clear to adhere, you may need to adjust the printing conditions of the underlying ink. For example, with UV-cured inks you may need to use a lower cure dose during ink curing. Call 3M Technical Service for assistance before continuing.

Maintenance and Cleaning of Finished Graphics

Use a cleaner designed for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without solvents, and have a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline). See [3M Instruction Bulletin 6.5](#) for details.

Shelf Life, Storage and Shipping

Shelf Life

Use by the expiration date shown on the product packaging.

Do not use a clear that shows signs of gelling.

Liquid clear can vary in color, depending on age and storage conditions. The color does not affect the performance or cured color of the clear.

Storage Conditions

- 32° to 80°F (0° to 27°C)
- Out of sunlight
- Clean, dry area
- Original container
- Bring the clear to room temperature before use
- Keep containers covered when not in use to prevent curing from room light

Shipping Finished Graphics

Flat, or rolled printed side out on 5 inch (13 cm) or larger core. This helps prevent the application tape, if used, from popping off.

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.

Release D MAR-2016:

- Added important warranty information to "Product Description" on page 1.
- Updated "Performance Characteristics" on page 1.
- Added test methods to help determine if latex inks are properly dried. See "Application Tapes" on page 3.
- Added Important Note about using the same container for more than 8 hours. See "Mixing" on page 5.

Release C OCT-2015:

- Added Important Note. See "Digital UV Ink" on page 4.
- Updated "Typical Coverage" on page 5.
- Updated "Fabric" on page 6.

Release B JULY-2015:

- Updated Product Bulletin to new format.

Screen Print UV Gloss Clear 9740i Screen Print Matte Clear 9730UV

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