

## 780mC-10R

### Product Description

- For Solvent, UV, and Latex Inkjet printing and Screen Printing
- 6.6-mil, flexible, enclosed lens, retroreflective

### Product Features

- Available in white only
- Film heals itself with heat recovery, helping minimize bruising for optimal reflectivity
- Flexible, conforms to compound curves, corrugations, and rivets
- Excellent retroreflectivity at wider viewing angles
- Includes Comply™ Adhesive for fast, easy bubble-free installations
- Pressure-activated adhesive for easy sliding and tacking, snap-up and repositioning
- Removable with heat and/or chemicals
- Expected Performance Life of 9 years (unwarranted period for unprinted film with no graphic protection, applied to a flat, vertical, outdoor surface)

### Recommended Types of Graphics and End Uses

- Wraps for vehicles, straight trucks, semi-trucks and semi-trailers
- Eligible for warranty coverage in horizontal vehicle wrap applications when protected with 3M overlaminates 8528, 8548G, and 8549L.
- Smooth and textured wall graphics, indoor and outdoor signs, including point-of-purchase and displays, parking structures and other non-government regulated applications
- Buses, vans, passenger vehicles, delivery and pickup trucks and enclosed trailers

When constructed and used as described in this Bulletin, these types of graphics and end uses may be warranted by the 3M™ MCS™ Warranty or the 3M Performance Guarantee. Please read the entire Bulletin for details.

#### IMPORTANT NOTE

This film is not recommended for use on stainless steel or chrome substrates. Contact your sales representative for information about products recommended for use with these substrates.

This film is not recommended for cut, weeded, or prespaced letters or decals. It also is not recommended for application over other films (as decals, lettering, striping, etc.). These applications are not covered by the warranty and the user must assume responsibility for testing and approving these applications.

### Recommended Compatible Products

See [3M.com/graphicswarranties](https://www.3m.com/graphicswarranties) for a complete list of compatible products that are approved by 3M for use with the base film covered in this Bulletin and used for the creation of a graphic that may be eligible for the 3M™ MCS™ Warranty or 3M Performance Guarantee.

### OEM Inkjet Inks and Printers for the 3M Performance Guarantee

See the [3M Performance Guarantee Matrix](#) for a complete list of compatible OEM Inkjet Inks and Printers that are approved by 3M for use with the base film described in this Bulletin and used for the creation of a completed graphic that may be eligible for the 3M Performance Guarantee.

#### Quick Links

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

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

## Graphic Protection

- [3M™ Gloss Wrap Overlamine 8418G](#)
- [3M™ Scotchcal™ Gloss Overlamine 8518](#)
- [3M™ Scotchcal™ Luster Overlamine 8519](#)
- [3M™ Scotchcal™ Gloss Overlamine 8528](#) *with horizontal vehicle warranty*
- [3M™ Envision™ Gloss Wrap Overlamine 8548G](#) *with horizontal vehicle warranty*
- [3M™ Envision™ Luster Wrap Overlamine 8549L](#) *with horizontal vehicle warranty*
- [3M™ Screen Print Gloss Clear 1920DR](#)
- [3M™ Screen Print UV Gloss Clear 9740i](#)
- [3M™ Piezo Inkjet Protective Clear 8530](#)
- [3M™ Wrap Overlamine Series 8900](#)
- [3M™ Scotchcal™ Luster Overlamine 8524](#)

## Screen Printing Inks for 3M™ MCS™ Warranty

- [3M™ Screen Printing Ink Series 1900 \(Solvent\)](#), line color and four color
- [3M™ Scotchlite™ Screen Printing Ink Series 2900 \(Solvent\)](#)
- [3M™ Screen Printing UV Ink Series 9800](#), line color and four color

## Application Tapes

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

## Other Products

- [3M™ Primer 94](#)
- [3M™ Edge Sealer 3950](#)
- [3M™ Edge Sealer Tape 8914](#)
- [3M™ Vehicle Channel Applicator Tool VCAT-2](#)
- [3M™ Roller S \(small hard roller\)](#)
- [3M™ Roller L \(large hard roller\)](#)
- [3M™ Scotchgard™ Paint Protection Film SGH6](#)

## Certificate of 3M™ MCS™ Warranty

Graphic manufacturers who produce digitally printed graphics made with all 3M Graphics Products, including 3M Ink purchased through a qualified 3M Distributor or 3M Printing Partner, may register to be recognized with a Certificate of 3M™ MCS™ Warranty. Only graphic manufacturers having a current Certificate of 3M™ MCS™ Warranty are eligible to extend this warranty to their customers.

**NOTE:** For non-digitally printed Finished Graphics, check your eligibility for the 3M™ MCS™ Warranty by viewing the Warranty Period found within the Product Bulletin or using the warranty selector at [www.3m.com/graphicswarranties](http://www.3m.com/graphicswarranties).

## Characteristics

These are typical values for unprocessed product. Processing may change the values.

## Physical Characteristics

Characteristic	Value
<b>Material</b>	Vinyl
<b>Film Color</b>	White Typical Coefficient of Retroreflection: 75-100
<b>Retroreflection Definition</b>	<p>The typical coefficient of retroreflection defined is measured at a <math>-4^\circ</math> entrance angle and a <math>0.2^\circ</math> observation angle. It is expressed in candlepower per foot-candle per square foot (candela/lux/square meter) per ASTM E810.</p> <p>The entrance angle is formed by a light beam striking the surface at a point and a line that is perpendicular to the surface at the same point.</p> <p>An observation angle is formed by the light beam striking the reflective surface and returning to the observer. From 800 feet (249 meters), a motorist normally views a graphic at a <math>0.2^\circ</math> angle.</p>
<b>Thickness</b>	With adhesive: 6.6 mil (0.17 mm)
<b>Adhesive</b>	Pressure-activated (slide, tack, snap-up, reposition) with air release channels
<b>Adhesive Color</b>	Clear (Silver)
<b>Liner</b>	Polyethylene-coated paper
<b>Adhesion, Typical 24 hours after application</b>	Aluminum, anodized: 3.5 - 4.5 lb/in (0.63 - 0.80 kg/cm) Aluminum, etched: 1.5 - 2.5 lb/in (0.27 - 0.45 kg/cm) Fruehauf pre-painted panels: 1 - 2 lb/in (0.18 - 0.36 kg/cm) Fiberglass reinforced plywood: 1 - 2 lb/in (0.18 - 0.36 kg/cm) Glass: 1 - 2 lb/in (0.18 - 0.36 kg/cm)
<b>Tensile Strength</b>	8.5 pounds/inch at 73 °F (1.5 kg/cm at 23 °C)
<b>Chemical Resistance</b>	<ul style="list-style-type: none"> <li>Resists mild alkalis, mild acids, and salt</li> <li>Excellent resistance to water (does not include immersion)</li> <li>Resists occasional fuel spills</li> </ul>
<b>Flammability</b>	ASTM E84 reports: 780mC or go to the On-line Product Catalog at <a href="http://3M.com/graphics">3M.com/graphics</a> All other test reports: call 1-800-328-3908

## Application Characteristics

Characteristic	Value
<b>Finished Graphic Application Recommendation</b>	Surface type: flat, with and without rivets, simple curves, compound curves, and corrugations  Substrate type: aluminum, glass, fiberglass reinforced plywood (FRP), paint (check adhesion to powder-coated or water-based paints), fiberglass with gel coat  Application method: Dry  Application temperature: <ul style="list-style-type: none"> <li>Air and substrate: 50–100 °F 10–38 °C)</li> <li>Watch for condensation if the substrate is cooler than the air</li> </ul>
<b>Applied Shrinkage</b>	0.015 inches (0.4 mm)
<b>Temperature Range After Application</b>	-30 to +200 °F (-34 to +93 °C) (not for extended periods of time at the extremes)
<b>Graphic Removal</b>	Removable with heat and/or chemicals from most substrates within the Warranty Period at 50 °F (10 °C) minimum (air and substrate)

## 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 [3M.com/graphicswarranties](https://www.3m.com/graphicswarranties) 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, 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 type, ink type, film name, and/or 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 [3M.com/graphicswarranties](https://www.3m.com/graphicswarranties).

### 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 -Inkjet

See the 3M Graphics Warranties Matrices at [3M.com/graphicswarranties](https://www.3m.com/graphicswarranties), for vertical warranty period information specific to your film.

### Warranty Period Matrices - Unprinted Film

**Table A.** Unprinted Film Warranty Period (in years) for Finished Graphics with no Graphic Protection in a Standard U.S. Vertical Exposure (see [3M Graphics Warranties Bulletin](#) for Graphic Type Definitions).

	Ink and Graphic Protection	VEH	OUT
<b>3M™ MCS™ Warranty</b>	None	7	7
<b>*Expected Performance Life (Unwarranted period of time)</b>	None	9	9

\*Expected Performance Life is a good faith estimate of how long unprinted product may perform satisfactorily based on 3M testing. There is no warranty for performance or durability.

## Warranty Period Matrices - Screen Printed Film

**Table B.** Warranty Period for Finished Graphics in a Standard U.S. Vertical Exposure.

Graphic Protection	SOLVENT 3M Ink Series 2900				SOLVENT 3M Ink Series 1900		UV Ink Series 9800			
	Line Color		4-Color		Line Color		Line Color		4-Color	
	VEH	OUT	VEH	OUT	VEH	OUT	VEH	OUT	VEH	OUT
1920DR	7	5	5	5	7	7	—	—	—	—
9740i	7	5	5	5	7	5	7	5	5	5
9800CL	—	—	—	—	—	—	5	5	5	5

## Reduced Warranty Period for Other Graphic Exposures

For other graphic exposures, determine the applicable reduced warranty period by multiplying the standard warranty period (in years) for your graphic construction as shown in the applicable warranty period tables by the percentage shown for the intended graphic exposure. See "Exposure Types" on page 3 of the 3M Graphics Warranties Bulletin for graphic exposure definitions.

**Table C.** Reduced Warranty Period in U.S. for Other Graphic Exposures

If the Graphic Exposure is:	Use this Percentage of Vertical Exposure, Warranty Period	Calculation Examples
Zone 3 Vertical	70%	0.7 x 7 years = 4.9 years
Zone 2 Horizontal	0%	0 x 4 years = 0 years

## Additional Limitations

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

## 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.

## Inkjet Printing

Always read and follow the ink manufacturer's written instructions on usage.

### Total Ink Coverage

The maximum recommended total ink coverage for this film is:

- **250%** is the maximum recommended total ink coverage for this film for all solvent, latex and UV inks.

Do not exceed the recommended total ink coverage for the ink series used on this product. Having too high a total physical ink amount on the product results in media characteristic changes, incomplete drying, overlamine lifting, and/or poor graphic performance. For additional details about total ink coverage, refer to the 3M Product and Instruction Bulletin for 3M inks or the [3M Performance Guarantee Matrix](#) for OEM inks.

#### **IMPORTANT NOTE**

To avoid issues with the film separating from the liner (a.k.a. film tunneling or liner pop-off), when using printers where the film must curve around a face-side roller prior to printing (i.e. some latex printers), advance the film and attach the leading edge to the takeup roll, so the film will remain under tension while printing. You can also tape the leading edge to some other material (leader paper), and tape that other material to the take-up roll. Or, if it is possible to change the web path on the printer, feed the film directly into the printing area without curving around a face-side roller.

#### **IMPORTANT NOTE**

Be sure to check the consistency of color on reflective film as it may appear different in daytime and nighttime lighting.

## Completely Dry Graphics

#### **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 specific ink's 3M Product and Instruction Bulletin for more details.

## Screen Printing

Formulations and processing conditions can affect ink durability. Refer to the Product and Instruction Bulletins for your ink for limitations and proper usage.

- Ink series 1900 and some colors in ink series 9800 are opaque. Be aware that opaque ink can prevent the film from retroreflecting in the screen printed areas. Ink series 2900 and the transparent colors from ink series 9800 are good choices when retroreflection is important in the screen printed areas.
- For graphics subjected to fuel vapors or occasional spills, use screen printing ink series 2900 and clear 1920DR.
- Oven dry the last color and the clear when using solvent-based inks on graphics needed for any corrugated application.

## Cutting

See [3M Instruction Bulletin 5.78](#) for Cutting Conformable Reflective Film.

See [3M Instruction Bulletin 4.1](#) for Sheeting, Scoring and Film Cutting details.

## Graphic Protection

Graphic protection may improve the appearance, performance and durability of the graphic. Click on the graphic protection options listed in Product Bulletin or see the [3M Graphics Market Product Catalog](#), for more information.

#### **IMPORTANT NOTE**

During installation, scratches may occur on films without graphic protection.

## Application Tapes

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

#### IMPORTANT NOTE

Do not attempt to exchange the liner. This will compromise the slideability of the film, and could negatively impact adhesion or appearance of the applied graphic, which is not covered by any 3M warranty.

## 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 5.78](#). Application: Conformable Reflective Film.
- [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 5.37](#) A Guide to Understanding and Applying Graphics to Common Smooth and Textured Wall Surfaces
- [3M Instruction Bulletin 5.4](#). Application, Fleet Trucks.
- [3M Instruction Bulletin 5.5](#) Application, General Procedures for Interior and Exterior Dry Application
- [3M Product and Instruction Bulletin V-Tools](#). 3M™ Vehicle Channel Applicator Tools.

#### IMPORTANT NOTE

This film is not recommended for use on low surface energy (LSE) substrates such as some plastics, powder-coated paint, etc. The user must assume responsibility for testing and approving these substrates.

#### IMPORTANT NOTE

Some substrates such as under-cured polyurethane paint, fiberglass, and some paint systems may continue to outgas for sometime. Two-part polyurethane paints and screen print clears may stop curing when the air and surface temperature are lower than 75°F (24°C). Make sure the substrate or paint is fully cured before applying the film or the applied film may bubble.

#### IMPORTANT NOTE

UV inkjet inks may crack if too much heat is used during graphic application to complex curves and deep contours as well as around rivets. When using heat during application, make sure the film surface temperature does not exceed 212° F (100° C). For best results, **always do a test application** of a printed graphic to determine how much heat can be used without damaging the image.

#### IMPORTANT NOTE

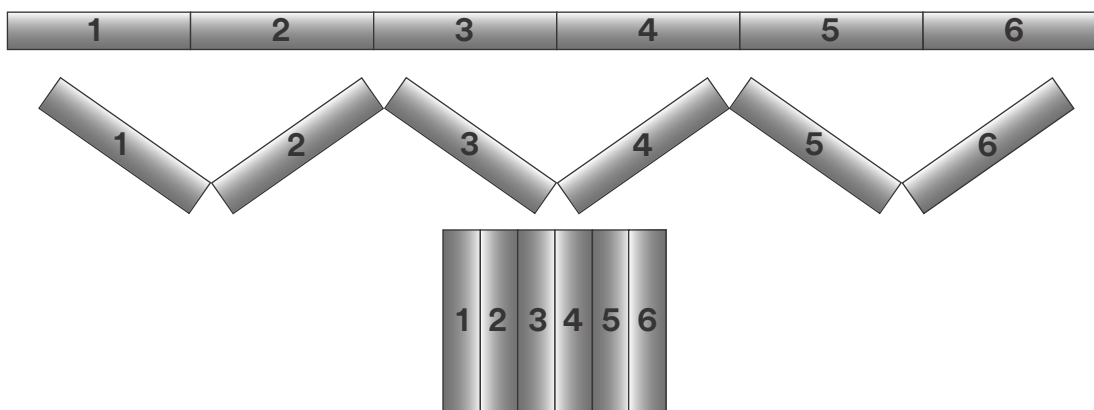
3M recommends using a heat gun to post-heat the applied film for all vehicle graphics. After applying the film (and this is especially important after removing application tape), all film edges and cut letters should be post-heated to a film surface temperature of 130 - 150°F (54 - 66°C) and then re-squeegeed. This should ensure adequate adhesion and minimize the risk for edge lifting. Film applied in deep channels and recessed areas should be post-heated to a film surface temperature of 200 - 225°F (93 - 107°C) to reduce the risk for lifting in those areas. Make sure the film is adhered to the substrate before using the heat gun or you may shrink or burn through the unsecured film!

## **i** IMPORTANT NOTE

The retroreflectivity values for the unprinted film are similar regardless of which way the film is rotated (0° versus 90°). However, the printed image may have variability caused by the printer (crossweb banding, etc.), so it may help to keep track of the film orientation during installation. The liner has arrows to indicate film direction.

## **i** IMPORTANT NOTE

Do not assume different run numbers will give a uniform nighttime appearance when placed side-by-side. When producing multipanel jobs, use film from the same roll (or at least the same run number). Apply adjacent panels with the film running in the same direction. If applying panels side-by-side, to overcome side-to-side variability within a roll, rotate every other panel by 180° in the RIP layout so the edges of adjacent panels meet from the same side of the roll. See Figure 1. Notice that the matching edges are always swung to meet each other. For example, the right side of panel 1 and the left side of panel 2 should come from the right side of the roll. (For more information, see section 4 of 3M Instruction Bulletin 4.1 Sheeting, Scoring and Film Cutting).



**Figure 1.** RIP Layout

## Pressure-activated Adhesive

The pressure activated adhesive on this film offers:

- Smooth sliding into position on a substrate;
- Fast finger tacking to check position; and
- Easy snap-up and repositioning when you need it.

The **snap-up and reposition feature is lost:**

- When firm pressure with a squeegee or other application tool is applied.
- At application temperatures above 100° F (38° C) even if only light finger pressure was used for tacking.
- If any part of the film is removed from the original liner and reapplied to the same or another liner.
- Solvent from inkjet ink has not completely dried or cured, which affects both slideability and snap-up.

## Working with Air Release Channels

Air release channels are a characteristic of films with Comply™ adhesive that allow trapped air to exit through the edges of the graphic.

- The channels will be damaged and effective air removal affected if you remove and attempt to change liners or reapply the same liner.
- For the best results, always work from the center out to the edges of the graphic to allow trapped air to exit through the air release channels. If the channels are closed off by firm pressure and air is trapped, use an air release tool to aid in removing air bubbles. See [3M Instruction Bulletin 5.4](#) for details.

## Video

Click [here](#) to see how 3M's Comply™ adhesive technology works.



## Stretchability

Many finished graphic constructions can be stretched without primer or relief cuts and maintain lift resistance.

- For Automobiles, Vans and Buses, see [3M Instruction Bulletin 5.36](#) for details and exceptions.
- For Straight trucks, semi-trucks and semi-trailers, see [3M Instruction Bulletin 5.4](#) for details and exceptions.

## 3M™ Tape Primer 94

3M recommends that where the film will be stretched, particularly on the edges of the film, use primer to maximize a graphic's bond to its substrate.

## Maintenance and Cleaning

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.

## Removal

Removal requires heat and/or chemicals. 3M makes no claims as to the ease or speed of removal. This product may not remove similarly to other products in the same category. See [3M Instruction Bulletin 6.5](#) for details.

## Shelf Life, Storage and Shipping

### Shelf Life

The shelf life is **never more than 3 years** from the date of manufacture on the original box.

If you process the film, the shelf life is changed to **1 year** from the processing date, but not later than the 3 year maximum from the manufacturing date.

### Storage Conditions

- 40° to 100 °F (4° to 38 °C)
- Out of sunlight
- Clean, dry area
- Original container
- Bring the film to room temperature before use

### Shipping Finished Graphics

Flat, or rolled printed side out on a 6 inch diameter (15 cm) or larger core. To reduce the risk of film tunneling or liner pop-off, keep the film under tension by taping the leading edge of the graphic to the core, and taping the trailing edge to the wound graphic. If layering samples on the same roll, tape the leading and trailing edges of each layer. (Use tape that has a weak bond to the film, so you don't damage the film when you remove the tape.) Never wind the film loosely without a core to support it!

## 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 manufacturer's instructions for safe operation.

### Commercial Solutions

3M Center, Building 220-12E-04  
St. Paul, MN 55144

1-800-328-3908  
[3M.com/Graphics](http://3M.com/Graphics)

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