



# Scotchcal™

## Graphic Film Series 3650

### Description

3M™ Scotchcal™ Graphic Film Series 3650 is an excellent choice for screen printing permanent graphics for signs and commercial vehicle, fleet graphics and OEM graphics. These films are long term durable. They resist gasoline vapors and occasional petroleum spills when used for fleet and vehicle graphics.

### Recommended Types of Graphics and End Uses

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

- Clear, window or 2-way graphics
- Outdoor and indoor graphics and signs
- Information labels
- Commercial vehicle and fleet graphics and emblems
- Small format original equipment manufacturer's decorative and identification graphics, cautionary, safety and vandal-resistant labeling

### Limitations of End Uses

We do not normally warrant other end uses, but please contact us to discuss your needs or let us suggest other 3M products.

### Unsuitable End Uses for this Film

- Graphics applied to:
  - corrugated surfaces.
  - stainless steel vehicles.
- Film without graphic protection under these conditions:
  - vehicle graphics.
  - exposure to abrasive conditions, harsh cleaners or chemicals.
- 3M Commercial Graphics Division policy is not to support applications of clear graphic film when a driver's view is obstructed and/or where local laws prohibit its use.

### Caution

Some states have laws or regulations requiring minimum light passage that may limit or preclude the use of this product on vehicle windows. The user is responsible for determining and complying with all applicable standards.

- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684 for alternatives.

### Compatible Products for 3M™ MCS™ Warranted Graphics

#### 3M Screen Printing Inks

- 3M™ Screen Printing Ink Series 1900  
*line color and four-color*
- 3M™ Screen Printing UV Ink Series 9800  
*line color and four-color*

#### 3M Graphic Protection Options

- 3M™ Screen Print Gloss Clear 1920DR
- 3M™ Screen Print Low Gloss Clear 1930
- 3M™ Screen Print Gloss Clear 9720UV
- 3M™ Screen Print Low Gloss Clear 9730UV
- 3M™ Screen Print UV Gloss Clear 9800CL
- 3M™ Screen Printing Clear VI0402

#### OEM Ink and Clear

- Sericol™ Duracal™ UV Screen Print Ink
- Sericol™ Duracal™ Screen Print Clear  
*(approved for OEM applications only)*

Note: See page 4 for how to obtain Duracal inks.

#### Other 3M Products

- 3M™ Edge Sealer 3950
- 3M™ Prespacing Tape SCPS-2
- 3M™ Prespacing Tape SCPS-53X
- 3M™ Premasking Tape SCPM-3
- 3M™ Premasking Tape SCPM-44X

## Characteristics

All values given are typical for unprocessed film unless noted otherwise and are not for use in specifications. Processing film may change certain values. Please contact the Technical Service helpline at 1-800-328-3908 if you need more detailed information.

### Physical Characteristics

Characteristic	Description
Material	Vinyl
Color	3650-10 white 3650-12 black 3650-114 clear
Thickness	<b>Without adhesive:</b> 2 mils (0.05 mm) <b>With adhesive:</b> 3 to 4 mils (0.08 to 0.10 mm)
Adhesive type	Pressure sensitive
Adhesive color	3650-10 gray-pigmented 3650-12 gray-pigmented 3650-114 clear
Liner	Polyethylene-coated layflat
Tensile strength ( <i>minimum</i> )	5.5 pounds/inch at 73°F (0.9 kg/cm at 23°C)
Adhesion <i>24 hours after application</i>	<b>ABS:</b> 5 pounds/inch (0.9 kg/cm) <b>Acrylic enamel:</b> 5 pounds/inch (0.9 kg/cm) <b>Aluminum, anodized:</b> 6 pounds/inch (0.11 kg/cm) <b>Chrome:</b> 5 pounds/inch (0.9 kg/cm) <b>Fruehauf prepainted panels:</b> 4 pounds/inch (0.7 kg/cm)
Chemical resistance	Resists mild acids, mild alkalis, and salts.  Excellent resistance to water ( <i>this does not include immersion</i> )

## Application Characteristics

Characteristic	Description
Finished graphic application recommendation	<b>Surface type:</b> Flat, with and without rivets  <b>Substrate type:</b> Glass, metal, paint, fiberglass reinforced plastic, rigid plastic  <b>Application temperature:</b> 50° to 100°F (10° to 38° C) <i>air and substrate</i>
Applied film shrinkage	0.015 inch (0.4 mm)
Finished graphic exposure temperature	-65° to +160°F (-54° to +70°C)
Graphic removal	Permanent

# Warranty Information

See the 3M Graphics Center Warranty Brochure for the complete warranty and remedy details. The warranty given in the Product Bulletin that is current at the time you purchased the film is the one that 3M will honor.

## 3M™ MCS™ Warranty for Finished Graphics

Warranted Durability for Graphic Constructions in a Vertical Exposure												
Warranties shown in years	Unprinted			Ink Series 1900			Ink Series 9800			Ink Series 9800 Metallic		
	Fleet Vehicle	OEM	Signs	Fleet Vehicle	OEM	Signs	Fleet Vehicle	OEM	Signs	Fleet Vehicle	OEM	Signs
<b>Graphic Protection</b>	<b>Film Colors 3650-10 and 12</b>											
1920DR	-	-	-	5	5	5	-	-	-	-	-	-
1930	-	-	-	2	2	2	-	-	-	-	-	-
V10402	-	-	-	6	5	6	-	-	-	-	-	-
9720UV	-	-	-	6	5	6	7	5	7	7	5	7
9730UV	-	-	-	3	3	3	3	3	3	-	-	-
9800CL	-	-	-	-	-	-	5	5	5	5	5	5
None												
3650-10	8	5	7	-	-	-	0	0	2	-	-	-
3650-12	7	5	7	-	-	-	0	0	2	-	-	-
<b>Graphic Protection</b>	<b>Film Colors 3650-114</b>											
1920DR	-	-	-	5	5	5	-	-	-	-	-	-
1930	-	-	-	2	2	2	-	-	-	-	-	-
V10402	-	-	-	5	5	5	-	-	-	-	-	-
9720UV	-	-	-	5	5	5	5	5	5	5	5	5
9730UV	-	-	-	3	3	3	3	3	3	-	-	-
9800CL	-	-	-	-	-	-	5	5	5	5	5	5
None	5	5	5	-	-	-	0	0	2	-	-	-

**Warranted Durability for OEM Applications**

OEM applications using Duracal UV Screen Print Ink (line colors) and Duracal Clear are warranted for 5 years.

**Formulas for Other U.S. Warranted Durabilities**

Use the warranted durability for your construction if exposed in a U.S. vertical orientation and use the following formulas to determine other durabilities.

Exposure	Percentage of U.S. Vertical Exposure	Example
U.S. Non-vertical	50% (0.5)	0.5 x 8 years = 4.0 years
Desert Southwest Vertical	70% (0.7)	0.7 x 8 years = 5.6 years
Desert Southwest Non-vertical	35% (0.35)	0.35 x 8 years = 2.8 years
Horizontal, Vehicle only	Warranted for legibility only for the stated durability.	

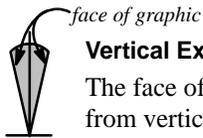
**Legibility Warranty for Horizontal Exposure of Vehicle Graphics**

Applications subjected to maximum sunlight and environmental conditions used on rooftops of commercially-owned fleet vehicles where identification from the air is needed. The graphic will change color, lose gloss, and chalk.

Film Colors 3650-10 and 12		Exposure in years	
Ink series	Clear	U.S.	U.S. Desert Southwest
Unprinted	None	5	3
9800	9720UV	5	3
	9800CL	5	3

## Warranty Notes

### Terms



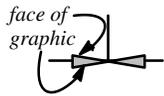
#### Vertical Exposure

The face of the graphic is  $\pm 10^\circ$  from vertical.



#### Non-Vertical Exposure

The face of the graphic is greater than  $10^\circ$  from vertical.



#### Horizontal Exposure for Vehicle Graphics Requiring Legibility Only

The face of the graphic is  $\pm 5^\circ$  from horizontal.

**Desert Southwest Exposure.** Graphics exposed to solar energy more than half of the time in Arizona, New Mexico and the desert areas of California, Nevada, Utah and Texas. A detailed map is available upon request.

**Fleet Vehicle.** Straight trucks and trailers used in commercial fleets.

**OEM.** Labels and decorative graphics produced for original equipment manufacturers.

**Signs.** Graphics applied outdoors and exposed to the elements.

### Graphic Performance Life

The actual performance life of a graphic depends on all of the following.

- Correct combination of 3M-recommended graphics products
- Ink formulation
- Ink drying and UV curing
- Selection and preparation of the substrate
- Surface texture
- Application methods
- Angle and direction of sun exposure
- Environmental conditions
- Cleaning or maintenance methods

### Graphic Protection

Any graphic exposed to abrasive conditions (including vehicle graphics), harsh cleaners or chemicals must include graphic protection in order to be warranted.

### Graphics Subjected to Gasoline Vapors or Spills

For the best protection against staining for screen printed graphics subjected to gasoline vapors or occasional spills, use ink series 1900 with clear V10402.

### Application Outside the U.S.

Contact the 3M organization for that country.

### Graphics Made with Components Not Sold or Recommended by 3M

The user is solely responsible for the graphic appearance, performance and durability when this film is used with any other manufacturers' inks, graphic protection and/or application tapes.

### Warranty and Limited Remedy

The following is made in lieu of all other express or implied warranties, including any implied warranty of **merchantability** or fitness for a particular purpose or implied warranty arising out of a course of dealing, custom or usage of trade: all 3M products are warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this Product Bulletin. 3M will replace or refund the price of any 3M materials that do not meet this warranty within the specified time periods. These remedies are exclusive. **In no case shall 3M be liable for any direct, indirect, or consequential damages, including any labor or non-3M materials charges.**

See the Graphics Market Center Warranty Brochure, which gives the terms, additional limitations of the warranty, if any, and limitations of liability.

### 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.

- The liner on film series 3650 is not printable. If you need a printable liner, contact Technical Service at 800-328-3908.
- Graphic protection can improve the appearance, performance and durability of your graphic. A clear coat also prevents chalking on unprinted colored films. Use standard screen printing methods to apply clear coats.

### Sericol Inks

Sericol's Duracal inks can be obtained through their distribution network. Please refer this web site for details: <http://www.sericol.com/Distributors/distribFR.htm>. You can also contact Sericol at: Sericol Inc. Corporate Office, 1101 W. Cambridge Drive, Kansas City, KS 66103  
Tel: 913-342-4060, Fax: 913-342-4752

## Cutting

The following are common cutting methods for this film. See Instruction Bulletin 4.1 for details.

- Bandsawing
- Hot kiss cutting
- Drum-type electronic cutting
- Flat-bed electronic cutting
- Guillotine
- Hand cut
- Cold and hot steel-rule die cutting

The following minimum values for cutting text from film series 3650 are based on upper case Helvetica medium type. Weeding is much more difficult with smaller text.

Minimum stroke width:	0.25 inch (6.35 mm)
Minimum height:	3.0 inch (76.2 mm)
Minimum radius for end of stripe:	0.024 inch (0.6 mm)

## Application Tapes

The type of 3M application tape to use depends on the type of graphic produced and the ink or screen print clear coat that was applied last. See Instruction Bulletin 4.3 for details.

- Use a prespacing application tape if the graphic has large amounts of the liner exposed.
- Use a premasking application tape if very little of the liner is exposed.

Last Coating	Prespacing Tape	Premasking Tape
Unprinted	SCPS-2	SCPM-3
1920DR	SCPS-2	SCPM-3
1930	SCPS-2	SCPM-3
9720UV	SCPS-53X	SCPM-44X
9730UV	SCPS-53X	SCPM-44X
Ink series 9800, no clear	SCPS-53X	SCPM-44X
9800CL	SCPS-53X	SCPM-44X

## Application

Refer to the 3M Related Literature section for a list of available application Bulletins. The following are application details specific to film series 3650.

### Positioning

This film has a pressure sensitive adhesive. On vehicles, do not use detergent and water or a commercial application liquid to position the graphic on vehicles.

### Finishing

If an application requires edge sealing, use edge sealer 3950.

## Removal

Film series 3650 is not a removable film. Removal requires a solvent-based or mechanical remover system. It may be very time consuming and may damage the substrate.

## Maintenance

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

Chalking on unprinted colored film can be washed off with normal graphic cleaning methods.

## Shelf Life, Storage, and Shipping

Activity	Recommendation
Shelf life	<b>Total shelf life: 2 years</b> Up to 2 years unprocessed, <b>OR</b> process within 1 year <b>and</b> apply within 1 year of processing
Storage conditions	<ul style="list-style-type: none"> <li>• 80°F (27°C) maximum</li> <li>• Out of sunlight</li> <li>• Clean dry area</li> <li>• Original container</li> <li>• Bring the film to room temperature before printing</li> </ul>
Shipping finished graphics	Flat, or rolled printed side out on 5 inch (13 cm) or larger core; this helps prevent the liner and premasking tape from wrinkling or popping off

## Health and Safety

### Caution

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information.

To obtain MSDS sheets for 3M products:

- By fax, call 1-800-364-0768 in the US and Canada or 1-650-556-8417 for all other locations.
- Electronically, visit us at <http://www.3M.com/MSDS>.
- 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.

**Attention:**  
**Authorized Graphics Manufacturers**

Visit our password-protected website for exclusive product information, profiles and services. Certain restrictions apply.

1. Go to [www.scotchprint.com](http://www.scotchprint.com).
2. Select a country.
3. Click *Login* on upper left side of screen.
4. Click Register.
5. Enter authorization code: **CGD\_SGN**.
6. Complete the information and submit.  
An e-mail will be sent when your authorization is completed.

## 3M Related Literature

**Before starting any job, be sure you have the most current Product and Instruction Bulletins.**

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins, as well as a list of all Bulletins updated within the last three months, are available at [www.scotchprint.com](http://www.scotchprint.com) or through our Fax-on-Demand system. Any warranty, if offered, is based on information in the appropriate Bulletin(s) that was current at the time you purchased the 3M products. The following Product and/or Instruction Bulletins provide the information and processes you need to properly make the graphics described in this Bulletin.

Fax-on-Demand phone numbers:  
United States or Canada: 1-800-364-0768  
International: 1-651-732-6506

Subject	Bulletin No.	FOD No.
<b>Product Bulletins</b>		
3M™ Screen Printing Ink Series 1900 and Screen Print Clear VI0402	1900	2501
3M™ Screen Printing Ink Series 9700UV	9700	2507
3M™ Screen Printing UV Ink Series 9800	9800	2513
<b>Instruction Bulletins</b>		
Screen printing with UV ink series 9800 - line color - 4-color	3.20 3.21	6020 6021
Screen printing with ink series 9700UV	3.4	6004
Screen printing with ink series 1900 - line color - 4-color	3.12 3.11	6012 6011
Design of graphics	2.1	5501
Scoring and cutting	4.1	6501
Using 3M application tapes; premasking and prespacing for films	4.3	6503
Application, substrate selection, preparation and substrate-specific application techniques	5.1	7001
Application, special applications and vehicles	5.4	7004
Application, general procedures for interior and exterior dry applications	5.5	7005
Storage, handling, maintenance, removal	6.5	8505
<b>Warranties</b>		
3M Graphics Market Center Warranty Brochure		9503

*3M, Controltac, MCS and Scotchcal are trademarks of 3M.*

### Bulletin Change Summary

Added warranties for OEM graphic constructions and reorganized the warranty information. Removed warranty exception about chalking. Deleted references to clear 1902DR and 9780UV, which were typographical errors. Other changes and additions are marked by black bars in the margins.



#### Graphics Market Center

3M Center, Building 220-12E-04  
PO Box 33220  
St. Paul, MN 55144-3220 USA  
General Info. 1-800-374-6772  
Technical Info. 1-800-328-3908  
Fax 1-651-736-4233

Fax-on-Demand 1-800-364-0768 US/Canada or 1-651-732-6506 International  
Fax-on-Demand document: 1509  
[www.3M.com/graphics](http://www.3M.com/graphics)

#### 3M Canada

P.O. Box 5757  
London, Ontario  
Canada N6A 4T1  
1-800-265-1840  
Fax 519-452-6245

#### 3M México, S.A. de C.V.

Av. Santa Fe No. 55  
Col. Santa Fe, Del. Alvaro Obregón  
México, D.F. 01210  
52-55-52-70-04-00  
Fax 52-55-52-70-22-77

#### 3M Puerto Rico, Inc.

Puerto Rico Industrial Park  
P.O. Box 100  
Carolina, PR 00986-0100  
787-620-3000  
Fax 787-750-3035