



Scotchcal™ Graphic Film

Series 3650

For Screen Printing Only

Description

Use this 2-mil film to screen print permanent, interior or exterior graphics. The film has pressure-sensitive adhesive, resists gasoline vapors and occasional petroleum spills, and is available in transparent, white or black. Applications include graphics for vehicles, windows, signs and more.

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™ MCST™ Warranty. Please read the entire Bulletin for details.

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

Limitations of End Uses

3M specifically does not recommend or warrant the following uses, but please contact us to discuss your needs or recommend other products.

Unsuitable End Uses for This Product

- Graphics applied to corrugated surfaces
- Graphics applied to stainless steel vehicles
- Fleet or vehicle graphics without graphic protection
- Any graphic without graphic protection that is exposed 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.
- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684 for alternatives.



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.

3M Graphic Materials

This Bulletin provides details about the base film and construction options and warranty. Additional specific information about compatible products can be found in the Product and Instruction Bulletins listed in **3M Related Literature** at the end of this bulletin.

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*

Graphic Protection

- 3M™ Screen Print Gloss Clear 1920DR
- 3M™ Screen Print Low Gloss Clear 1930
- 3M™ Screen Print Gloss Clear 9720i
- 3M™ Screen Print Gloss Clear 9720UV
- 3M™ Screen Print Low Gloss Clear 9730UV
- 3M™ Screen Print UV Gloss Clear 9800CL
- 3M™ Screen Printing Clear V10402

OEM Inks and Clears

For OEM graphics only!

- Serico™ Duracal™ UV Screen Print Inks
- Sericol™ Duracal™ Screen Print Clear (approved for OEM applications only)

Identify a Sericol's Duracal inks distributor at: www.sericol.com/Distributors/distribFR.htm. Or contact Sericol Inc. Corporate Office; 1101 W. Cambridge Drive, Kansas City, KS 66103; Tel: 913-342-4060, Fax: 913-342-4752.

Other 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

These are typical values for unprocessed product; processing may change the values. Contact your 3M representative for a custom specification.

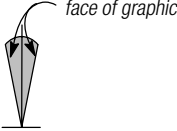
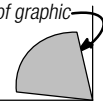
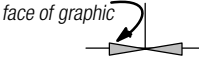
Physical Characteristics

| Characteristic | Value |
|--|--|
| Material | Vinyl |
| Color | 3650-10: White 3650-12: Black 3650-114: Clear |
| Thickness | Without adhesive: 2 mils (0.05 mm) With adhesive: 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) |

Application Characteristics

| Characteristic | Value |
|---|---|
| Adhesion <i>24 hours after application</i> | ABS: 5 pounds/inch (0.9 kg/cm) Acrylic, enamel: 5 pounds/inch (0.9 kg/cm) Aluminum, anodized: 6 pounds/inch (0.1 kg/cm) Chrome: 5 pounds/inch (0.9 kg/cm) Fruehauf pre-painted panels: 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>) |
| Finished graphic application recommendation | Surface type: Flat, with and without rivets Substrate type: Glass, metal, paint, fiberglass reinforced plastic, rigid plastic Application temperature: 50° to 100°F (10° to 38° C) <i>air and substrate</i> Application method: Fleet & Vehicles: dry All others: wet or dry |
| Applied film shrinkage | 0.015 inch (0.4 mm) |
| Finished graphic exposure temperature | -65° to +160°F (-54° to +70°C) |
| Graphic removal | Permanent |

Definitions

| | | | |
|-----------------|---------------------------------------|---|--|
| Exposure | U.S. Vertical Exposure |  | The face of the graphic is +/- 10° from vertical. |
| | U.S. Non-vertical Exposure |  | The face of the graphic is greater than 10° from vertical and greater than 5° from horizontal. This includes non-vertical surfaces of vehicle wraps or fleet graphics. |
| | U.S. Horizontal Exposure |  | The face of the graphic is +/- 5° from horizontal. |
| | U.S. Desert Southwest Exposure | | Any outdoor graphic exposed to solar energy more than half of the daylight hours in Arizona, New Mexico and the desert areas of California, Nevada, Utah and Texas is subject to reduced warranties. A detailed map is available at 3Mgraphics.com under Warranties. |

Graphic Construction The products used to make a graphic, which may include film and/or flexible substrate, graphic protection, ink, printer and application tape.

Graphic Protection Overlaminated films or clear coats used to protect the graphic and/or change gloss.

| | | |
|----------------------|----------------------|---|
| Graphic Types | Indoor Signs | Stationary graphics applied indoors and <i>not</i> exposed to the elements. |
| | Outdoor Signs | Stationary graphics applied outdoors and exposed to the elements. |
| | OEM | Labels and decorative graphics produced for and used by original equipment manufacturers. |

| | | |
|----------------|----------------------|--|
| Vehicle | Fleet Vehicle | Straight trucks, semi-tractors and trailers used in commercial fleets. Excludes air shields. |
|----------------|----------------------|--|

Warranty Information

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 *3M Graphics Market Center Warranty Brochure* at 3Mgraphics.com, which gives the terms, additional limitations of the warranty, if any, and limitations of liability.

Warranty Coverage Overview Both the warranty coverage and the durability for each graphic are based on the user(s) reading and following all applicable and current 3M Product and Instruction Bulletins. 3M will honor the Warranted Durability stated in the Warranted Durability Table in the base film or substrate Product Bulletin that is current when the film was purchased. Warranted durabilities may be reduced and stipulations may apply for certain constructions and applications, as covered in this Bulletin.

3M™ MCS™ Warranty
Warranted Durability Table
for Finished Graphics
in a Standard U.S. Vertical Exposure

Veh = Vehicle Graphics, including Fleet
OEM = Small format Original Equipment Manufacturer labels and graphics
Signs = Indoor and Outdoor Sign Graphics

Warranted Durability Given in Years

| Graphic Protection | No Printing | | | Ink Series 1900 | | | Ink Series 9800 | | | Ink Series 9800 Metallic | | |
|-------------------------------|-------------|-----|-------|-----------------|-----|-------|-----------------|-----|-------|--------------------------|-----|-------|
| | Veh | OEM | Signs | Veh | OEM | Signs | Veh | OEM | Signs | Veh | OEM | Signs |
| Films 3650-10, 3650-12 | | | | | | | | | | | | |
| 1920DR | — | — | — | 5 | 5 | 5 | — | — | — | — | — | — |
| 1930 | — | — | — | 2 | 2 | 2 | — | — | — | — | — | — |
| V10402 | — | — | — | 6 | 5 | 6 | — | — | — | — | — | — |
| 9720i | — | — | — | 6 | 5 | 6 | 7 | 5 | 7 | 7 | 5 | 7 |
| 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 | — | — | — | — | — | 2 | — | — | — |
| 3650-12 | 7 | 5 | 7 | — | — | — | — | — | 2 | — | — | — |
| Film 3650-114 | | | | | | | | | | | | |
| 1920DR | — | — | — | 5 | 5 | 5 | — | — | — | — | — | — |
| 1930 | — | — | — | 2 | 3 | 3 | — | — | — | — | — | — |
| V10402 | — | — | — | 5 | 5 | 5 | — | — | — | — | — | — |
| 9720i | — | — | — | 5 | 5 | 5 | 5 | 5 | 5 | 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 | — | — | — | — | — | — | — | — | — |

3M™ MCS™ Warranty
Using Sericol Inks

Application: OEM graphics only

Film: 3650-10, 3650-12, 3650-114

Ink and Graphic Protection: Sericol Duracal UV Screen Print Ink and Clear

Warranty: 3 years in a vertical exposure

Legibility Warranty

For Fleet Graphics ONLY for Horizontal Exposure and Selected Constructions

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

Warranted in Years

| Films 3650-10, 3650-12 | | Horizontal Exposure | |
|------------------------|---------------------------|---------------------|-----------------------|
| Ink Series | Clear | U.S. | U.S. Desert Southwest |
| No printing | None | 5 | 3 |
| 9800 | 9720i 9720UV 9800CL | 5 | 3 |

Warranty Stipulations

These stipulations apply to the 3M™ MCS™ Warranty. Also see the Graphics Market Center Warranty Brochure.

Reduced Durability Stipulations for Graphics in a Non-Vertical or Desert Southwest Exposure

Use the years of warranted durability indicated in the applicable durability table, above, for your graphic construction and the following formulas to determine other durabilities.

| If the Graphic Exposure is | Use this Percentage of U.S. Vertical Exposure Warranty | Examples |
|-------------------------------|--|-----------------------------|
| U.S. Non-vertical | 50% (0.5) | 0.5 x 5 years = 2.5 years |
| Desert Southwest Vertical | 70% (0.7) | 0.7 x 5 years = 3.5 years |
| Desert Southwest Non-vertical | 35% (0.35) | 0.35 x 5 years = 1.75 years |
| U.S. Horizontal | Warranted for legibility only. See the following section, too. | |

Abrasion and Loss of Gloss

Abrasion damage and loss of gloss are not covered by any 3M warranty. This is considered normal wear and tear.

Application to Glass

3M accepts no liability for glass breakage when using this film for window graphics. See Instruction Bulletin 5.1 for details.

Application Outside the U.S.

Contact the 3M organization for that country.

Gasoline Vapor and Occasional 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.

Graphics Made with Components Not Sold or Recommended by 3M

The 3M™ MCS™ Warranty does not cover finished graphics made with inks, film, graphic protection and/or application tapes that are not sold or recommended by 3M. The user is solely responsible for the graphic appearance, performance and durability of graphic constructions that include any other products.

Graphic Protection

- Clear 1930 may haze, which is not warranted.
- Any graphic exposed to abrasive conditions (including fleet and vehicles), harsh cleaners or chemicals must include graphic protection in order to be warranted. Abrasion damage and gloss loss are not covered.

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

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.

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

When to Use Premasking Tape

- As an application aid to increase stiffness, and prevent stretching and damage during application.
- When little or no liner is exposed.

When to Use Prespacing Tape

- Hold cut and weeded letters or graphics in registration after removing the film liner.
- Protect cut graphic parts from scratching or damage during application.
- Use when large amounts of liner are exposed.

How to Select a Tape

Determine whether you want to premask the graphic or prespace cut pieces of film such as letters. In the table below, locate the last coating applied to your graphic and use the corresponding tape. See Instruction Bulletin 4.3 for complete details.

EXAMPLE: If the film is protected by clear 9720i and you want to premask the film, use premasking tape SCPM-44X.

| Tape | Graphic Protection | | | | |
|---------------------|--------------------|--------------|---------------------|---------------|--------|
| | Unprinted | 1920DR, 1930 | 9720i 9720UV 9730UV | 9800 Ink Only | 9800CL |
| Premasking SCPM-3 | ■ | ■ | | | |
| Prespacing SCPS-2 | ■ | ■ | | | |
| Premasking SCPM-44X | | | ■ | ■ | ■ |
| Prespacing SCPS-53X | | | ■ | ■ | ■ |

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.

Application Method

A wet or dry application method may be used, EXCEPT on vehicles, which must be dry applied.

Edge Sealing

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

Shelf Life

Total shelf life: 3 years from the date of manufacture on the original box. Up to 3 years unprocessed, **OR** process within 2 years **and** then apply within 1 year of processing.

Storage Conditions

- 40° to 80°F (4° to 27°C)
- Out of sunlight
- Clean dry area
- Original container
- Bring the film to print room temperature before using

Shipping Finished Graphics

Flat, or rolled printed side out on 5 inch (13 cm) or larger core. This helps prevent the liner and, if used, the application tape from 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 go to 3M.com/MSDS, 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.

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 are available at 3Mgraphics.com. The techniques described in these Bulletins are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

| Subject | Type | Bulletin No. |
|---|-------|--------------|
| 3M™ Screen Printing Ink Series 1900 and Overprint Clear V10402 | PB | 1900 |
| - Screen printing with ink series 1900 - line color | IB | 3.12 |
| - Screen printing with ink series 1900 - 4-color | IB | 3.11 |
| 3M™ Screen Printing UV Ink Series 9800 | PB | 9800 |
| - Screen printing with UV ink series 9800 - line color | IB | 3.20 |
| - Screen printing with UV ink series 9800 4-color | IB | 3.21 |
| 3M™ Screen Print UV Gloss Clear 9720i , 9720UV, 9730UV | PB-IB | Clears 9720 |
| Preparation for four color screen printing | IB | 1.1 |
| Design of graphics | IB | 2.1 |
| Using 3M application tapes; premasking and prespacing for films | IB | 4.3 |
| Application, substrate selection, preparation and substrate-specific application techniques | IB | 5.1 |
| Application, special applications and vehicles | IB | 5.4 |
| Application, general procedures for indoor and outdoor dry applications | IB | 5.5 |
| Storage, handling, maintenance, removal | IB | 6.5 |

Warranties

3M Graphics Center Warranty Brochure [Go to www.3Mgraphics.com](http://www.3Mgraphics.com), Warranties

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Bulletin Change Summary

Added clear 9720i. Total shelf life increased from 2 years to 3 years.



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