



Scotchcal™ Graphic Film Series 3650

Note: Film series 3650 is now available only in clear, white and black film. For additional colors, we recommend using 3M™ Controltac™ Plus Graphic Film Series 180 or 3M™ Scotchcal™ Electrocut™ Graphic Film Series 7725.

Description

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

Advantages

- Screen printable
- Up to eight years warranted exterior durability
- Permanent

Applications and Uses

Film series 3650 is intended for making permanent graphics when used with the listed Compatible Products in the following applications. These types of applications are warranted by the 3M™ MCS™ Warranty.

- Clear, window or 2-way graphics
- Exterior graphics and signs
- Interior graphics and signs
- Information labels
- Commercial vehicle and fleet graphics and emblems

Limitations of Uses

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

Specifically, we do not warrant this film for the following:

- Application to corrugated surfaces
- Application to stainless steel
- 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, Ext. 444, for alternatives.

Compatible Products

- 3M™ Screen Printing Ink Series 1900
- 3M™ Screen Printing Ink Series 3900*
- 3M™ Screen Printing Overprint Clear VI0402
- 3M™ Screen Printing Ink Series 9700UV (line color and four color)
- 3M™ Edge Sealer 3950

Note: Ink series 3900 is no longer available. It is replaced by ink series 1900, which carries the same warranted durability. You may continue to use up existing inventory of ink series 3900 for making warranted graphics.

Characteristics

Characteristic	Description
Film	2 mil (0.05 mm) vinyl
Thickness (film and adhesive)	3 to 4 mil (0.08 to 0.1 mm)
Colors	3650-10 white 3650-12 black 3650-114 clear
Adhesive	Pressure sensitive
Adhesive color	3650-10 gray-pigmented 3650-12 gray-pigmented 3650-114 clear
Liner	108 pound, polyethylene-coated paper
Application surfaces	Flat, with and without rivets

Characteristics continued on the next page.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Characteristics continued from the previous page.

Characteristic	Description
Recommended substrates	Glass, metal, paint, fiberglass reinforced plastic, rigid plastic
Application temperature range	50° to 100°F (10° to 38° C)
Removability	Permanent
Roll sizes	24 in. x 50 yards (61 cm x 45 m) 36 in. x 50 yards (91 cm x 45 m) 48 in. x 50 yards (122 cm x 45 m)

Effective Performance Life

The effective performance life for film series 3650 is based on field experience and exposure tests conducted throughout the United States. When the graphics are processed and used according to the 3M recommendations, they should have the performance life shown in the table below. The actual performance depends on the:

- Correct combination of film, ink, and clear coat
- Ink formulation
- Ink drying methods
- Selection and preparation of the substrate
- Application methods
- Exposure conditions
- Cleaning methods

Warranted Durability



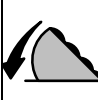
Sign Graphics - Unprinted, no clear coat						
Film	Vertical Exposure face of graphic is ± 10° from vertical		Non-Vertical Exposure face of graphic is more than 10°-45° from vertical		Horizontal Exposure face of graphic is more than 45° from vertical; warranted for visibility only	
	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years
3650-10	7	4	4	2	0	0
3650-12	7	4	4	2	0	0
3650-114	5	3	3	2	0	0
Vehicle Graphics - Unprinted, no clear coat						
Film	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years
3650-10	8	5	5	3	5	3
3650-12	7	4	4	2	5	3
3650-114	5	3	3	2	0	0

¹ For warranty periods outside the United States, contact the 3M sales organization for that country.

² The U.S. Desert Southwest includes Arizona, New Mexico, and the desert areas of California, Nevada, Utah, and Texas. A detailed map is available by request. The warranty for this area is reduced because there is more solar energy. This warranty applies to graphics exposed to solar energy in the U.S. Desert Southwest more than 50% of the time.

Continued on page 3.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Vehicle or Sign Graphics							
Film and Ink	Clear Coat	 Vertical Exposure <i>face of graphic is ± 10° from vertical</i>		 Non-Vertical Exposure <i>face of graphic is more than 10°-45° from vertical</i>		 Horizontal Exposure <i>face of graphic is more than 45° from vertical; warranted for visibility only</i>	
		U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years
3M™ Screen Printing Ink Series 1900							
3650-10	1920DR <i>Air dry</i>	5	3	3	2	0	0
3650-12	1920DR <i>Oven dry</i>	6	4	4	2	0	0
	1930	2, <i>may haze</i>	1, <i>may haze</i>	1, <i>may haze</i>	1, <i>may haze</i>	0	0
	VI0402	6	4	4	2	0	0
	9720UV	6	4	4	2	0	0
	9730UV	3	2	2	1	0	0
3650-114	1920DR <i>Air dry</i>	5	3	3	2	0	0
	1920DR <i>Oven dry</i>	5	3	3	2	0	0
	1930	2, <i>may haze</i>	1, <i>may haze</i>	1, <i>may haze</i>	1, <i>may haze</i>	0	0
	VI0402	5	3	3	2	0	0
	9720UV	5	3	3	2	0	0
	9730UV	3	2	2	1	0	0
3M™ Screen Printing Ink Series 9700UV (line color only)							
3650-10	None	2	1	1	1	0	0
3650-12	9720UV	7	4	4	2	5	3
	9730UV	3	2	2	1	0	0
3650-114	None	2	1	1	1	0	0
	9720UV	5	3	3	2	0	0
	9730UV	3	2	2	1	0	0
3M™ Four Color Screen Printing Ink Series 9700UV							
3650-10	None	2	1	1	1	0	0
3650-12	9720UV	7	4	4	2	0	0
	9730UV	3	2	2	1	0	0
3650-114	None	2	1	1	1	0	0
	9720UV	5	3	3	2	0	0
	9730UV	3	2?	2	1	0	0

¹ For warranty periods outside the United States, contact the 3M sales organization for that country.

² The U.S. Desert Southwest includes Arizona, New Mexico, and the desert areas of California, Nevada, Utah, and Texas. A detailed map is available by request. The warranty for this area is reduced because there is more solar energy. This warranty applies to graphics exposed to solar energy in the U.S. Desert Southwest more than 50% of the time.

Warranty Exceptions

- Unprinted film 3650-10 has a tendency to chalk in exterior applications. Film that cannot be cleaned must be printed with clear coat 1920DR, 9720UV or 9730UV. The warranty is the same as for the ink being applied to the film.
- For the best protection for screen printed graphics subjected to gasoline vapors or occasional spills, use ink series 1900 with clear coat VI0402.

- Graphics exposed to abrasive washing conditions, harsh cleaners or chemicals required a clear coat.

Horizontal Warranty Exceptions and Restrictions

Horizontal applications on film series 3650 can be used on the rooftops of commercially-owned vehicles where identification from the air is needed. Horizontal applications are subjected to the maximum sunlight and environmental conditions. The graphic will change color, lose gloss, and chalk. Use clear coat 9720UV in these applications.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Screen Printing

To get the durability given in the Effective Performance Life section, use the correct combination of ink and clear coat. Carefully follow the processing directions. Check the appropriate Product Bulletins and Instruction Bulletins for the limitations of each particular ink. Refer to the 3M Related Literature section on page 7.

The liner on film series 3650 is not printable. If you need a printable liner, contact Technical Service at 800-328-3908.

Compatible Inks

Refer to Compatible Products on page 1.

- Ink series 1900
- Ink series 9700UV

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 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.

Clear Coat	Prespacing	Premasking
Unprinted	SCPS-2	SCPM-3
1920DR 1930	SCPS-2	SCPM-3
9720UV 9730UV 9780UV 9700UV (no clear coat)	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.

Temperature

The application temperature for film series 3650 is 50° to 100°F (10° to 38°C) for flat and riveted surfaces.

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.

Removability

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.

Shelf Life, Shipping, and Storage

- Unprocessed film series 3650 has a shelf life of two years after receipt. Processed film has a shelf life of one year. However, the total shelf life of a graphic before and after processing cannot exceed two years.
- Store the film in a clean, dry area in the original container.
- Store the film out of the direct sunlight and at less than 100°F (38°C).
- Ship the finished graphic lying flat or in a roll. To roll the graphic, roll it film side out onto a core that is 5 inches (13 cm) or larger in diameter. These methods help prevent the film and premasking from wrinkling or popping off the liner.

Note: For the full product names of the 3M products listed on this page, please see page 1.

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.

Product Data

Values given are typical for film series 3650 and are not for use in specifications. For a custom specification, submit a request to your 3M sales representative. The data given below is for unprinted film.

Physical Characteristics

Property	English Units	Metric Units
Tensile strength (minimum)	5 pounds/inch at 73°F	0.9 kg/cm at 23°C
Applied shrinkage	0.015 inch	0.4 mm
Service temperature range	-65° to +225°F	-60° to +107°C

Adhesion Characteristics

Substrate	English Units <i>pounds/inch</i>	Metric Units <i>kg/cm</i>
ABS	4	0.7
Acrylic enamel	4	0.7
Aluminum, anodized	6	1.1
Chrome	5	0.9
Fruehauf pre-painted panels	4	0.7

Chemical Resistance Characteristics

- Resists mild alkalis, mild acids and salt.
- Excellent resistance to water.

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: Film series 3650 is 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. See the worldwide 3M™ MCS™ Warranty bulletin, which gives the terms and limitations of the warranty.

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.

Scotchprint® Graphics Network

There's a whole other world behind the Scotchprint® Graphics Internet site (www.scotchprint.com) and you can travel there with the Scotchprint® Graphics Network. This password-protected Web site opens the door to exclusive Scotchprint® Graphics product information, services and e-deals (product promotions) that are not available on our regular Internet site.

There's no charge and you can sign up today. Just ask your Commercial Graphics Division sales representative, or contact Lisa Burns (ljburns3@mmm.com or 651-736-9719).

3M Related Literature

Listed below is related 3M technical literature that may be of interest. You may view and print these Bulletins from our Web site at www.scotchprint.com, or order them via our Fax-on-Demand (FOD) system. Call one of these phone numbers to order the desired bulletins, and specify the FOD document number provided in the chart.

United States or Canada: 1-800-364-0768
International: 1-651-732-6506

Subject	Bulletin No.	FOD No.
Product Bulletins		
3M™ Screen Printing Ink Series 1900	1900	2501
3M™ Screen Printing Ink Series 9700UV	9700	2507
Instruction Bulletins		
Screen printing with ink series 9700UV - line color - 4-color	3.4 3.13	6004 6013
Screen printing with ink series 1900 - line color - 4-color	3.11 3.12	6011 6012
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
Warranties		
Worldwide 3M™ MCS™ Warranty Packet (includes all Commercial Graphics MCS Warranties)		9503
Worldwide 3M™ MCS™ Warranty Overview-Folder		9504



Commercial Graphics Division

3M Center, Building 220-6W-06
PO Box 33220
St. Paul, MN 55133-3220 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.scotchprint.com

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

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