



Scotchcal™ Graphic Film

IJ3650-10, IJ3650-114, FN3650-114, RG3650-114

For Piezo Inkjet Printing Only

Product Description

These are 2-mil, opaque white or translucent films with a permanent, pressure-sensitive adhesive. They are an excellent choice for medium-term cut graphics or single panel vertical graphics and signs. Use for piezo inkjet printing.

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 or the 3M Performance Guarantee. Please read the entire Bulletin for details.

- Film IJ3650-114, RG3650-114 and FN3650-114 (transparent) vertical graphics for:
 - Indoor and outdoor translucent graphics and signs for windows
 - Two way graphics
 - Backlit graphics
- Film IJ3650-10 (white) vertical graphics for:
 - Indoor and outdoor opaque graphics, signs and markings

Limitations of End Uses

This film is not suitable for these uses

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

- Fleet graphics
- Application to corrugated surfaces
- Stainless steel
- Graphics subjected to gasoline vapors or spills at gas pumps, automobile fuel-tank ports, or top-feeding, petroleum tankers.
- Non-vertical graphics
- Multi-panel graphics as overlapping joints will show as a dark line
- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684 for alternatives.

Note: 3M Commercial Graphics Division policy is not to support applications of clear film when a driver's view is obstructed and/or where local laws prohibit its use.



Some states have laws or regulations requiring minimum light passage that may limit or preclude the use of transparent film IJ3650-114, FN3650-114 or RG3650-114 on vehicle windows. The user is responsible for determining and complying with all applicable standards.

Important Information About Bus Applications

Film used on buses must not be applied so as to restrict the safe use of emergency window exits. See the most current version of Instruction Bulletin 5.4 for details.

Compatible Products

3M Graphic Materials

For complete details about graphic construction options, recommended uses and durability, refer to the Product Bulletin for the base film or substrate (media) you are using. See **3M Related Literature** at the end of this Bulletin.

Piezo Inkjet Printers and Inks

See the Warranty Matrix to determine if you need an IJ, FN or RG prefix film.

Ink Series

- 3M™ Piezo Inkjet Ink Series 1500v2
- 3M™ Piezo Inkjet Ink Series 4400
- 3M™ Piezo Inkjet Ink Series 4600
- 3M™ Piezo Inkjet Ink Series 4800
- 3M™ Piezo Inkjet Ink Series 5500
- 3M™ Piezo Inkjet Ink Series 6000
- 3M™ Piezo Inkjet Ink Series 6800
- 3M™ Piezo Inkjet Ink Series 2200UV
- 3M™ Piezo Inkjet Ink Series 2600UVv2
- 3M™ Piezo Inkjet Ink Series 2700UV
- 3M™ Piezo Inkjet Ink Series 2800UV
- 3M™ Piezo Inkjet Ink Series 5400UV
- Mimaki Ink Series LF-200 *manufactured by 3M*

Printer

- EFI™ VUTEK® 150, 2360/3360, 3300/5300 and 3000/5000 Printers
- HP XLJet 1200 and 1500 Printers
- HP Scitex Pressjet-W™ Printer
- HP Scitex TJ8300 Series Digital Press
- Océ Arizona 600 Printer
- Océ Arizona 30s Printer
- Océ Arizona 180 and 90 Printers
- EFI™ VUTEK® PV 200 Printer
- 3M™ Printer 2500UV
- Durst Rho 160R Printer
- EFI™ VUTEK® QS2000/QS3200 Printers
- MacDermid ColorSpan 5400uv Printer
- Mamiki UJV-160 Printer

*For the best results, order films for Scitex printers on a 6 inch notched core.

Graphic Protection Options

- 3M™ Scotchcal™ Luster Overlamine 3619
- 3M™ Scotchcal™ Matte Overlamine 3620
- 3M™ Scotchcal Luster Overlamine 8519
- 3M™ Scotchcal Matte Overlamine 8520
- 3M™ Scotchcal Luster Overlamine 8908
- 3M™ Scotchcal Matte Overlamine 8909
- 3M™ Screen Print Gloss Clear 1920DR
- 3M™ Screen Print Gloss Clear 9720UV
- 3M™ Screen Print Gloss UV Clear 9720i

Other Products

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

Characteristics

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

Physical Characteristics

Characteristic	Description
Film	Vinyl
Colors	IJ3650-10: White IJ/FN/RG3650-114: Transparent
Thickness	Without adhesive: 2 mils (0.05 mm) With adhesive: 3 to 4 mil (0.08 to 0.1 mm)
Adhesive type	Pressure sensitive
Adhesive color	Gray
Liner	Polyethylene-coated paper

Continued on the next page

Characteristic	Description
Tensile strength	5 pounds/inch at 73°F (0.9 kg/cm at 23°C) <i>minimum</i>
Liner	Polyethylene-coated paper
Adhesion <i>24 hours after application</i>	ABS: 4 pounds/inch (0.7 kg/cm) Acrylic enamel: 4 pounds/inch (0.7 kg/cm) Fruehauf pre-painted panels: 4 pounds/inch (0.7 kg/cm) Aluminum, anodized: 8 pounds/inch (1.4 kg/cm) Chrome: 5 pounds/inch (0.9 kg/cm)
Chemical resistance	Resists mild alkalis, mild acids, and salt Excellent resistance to water (<i>this does not include immersion</i>)
Flammability	Call 1-800-328-3908 for information

Application Characteristics

Characteristic	Description
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: Dry
Applied film shrinkage	0.015 inch (0.4 mm)
Finished graphic exposure temperature	-65° to +225°F (-54° to +107°C)
Graphic removal	Permanent

Warranty Information

The warranted durability given in the Product Bulletin that is current at the time you purchased the film is the one that 3M will honor. **The warranties in the following table(s), given in years, are for finished graphics exposed in a vertical exposure in the United States except the Desert Southwest.** See the warranty sections following this table for additional information.

3M™ MCS™ Warranty for Finished Graphics

Veh = Vehicle Graphics
Out = Outdoor Signage
In = Indoor Signage

Vertical Exposure, Warranty in Years

Graphic Protection	EFI™		HP		HP Scitex		HP Scitex	
	VUTEk® 150, 2360/3360, 3300/5300, 3000/5000		XLJet Series 1200, 1500		Pressjet™ -W		TJ8300 Series Digital Press	
	Ink Series 1500v2		Ink Series 4400		Ink Series 4600		Ink Series 4800	
Use IJ Films	Use IJ Films		Use IJ Films		Use IJ Films		Use IJ Films	
	outdoor	indoor	outdoor	indoor	outdoor	indoor	outdoor	indoor
3619, 3620	5	8	5	8	5	8	5	8
8519, 8520	4	8	4	8	4	8	4	8
8908, 8909	1	3	1	3	1	3	1	3
8915	4	8	4	8	4	8	4	8
1920DR	—	—	—	—	4	8	3	8
9720UV	—	—	—	—	4	8	3	8
9720i	4	8	4	8	4	8	4	8
none	2	2	2	3	3	3	2	3

NOTE: Film IJ3650-10 only for these 3 inks

Graphic Protection	Océ		Océ		Océ	
	Arizona 30s		Arizona 600		Arizona 180 and 90	
	Ink Series 6000		Ink Series 5500		Ink Series 6800	
Graphic Protection	Use IJ Films		Use FN films		Use RG films	
	outdoor	indoor	outdoor	indoor	outdoor	indoor
3619, 3620	5	8	5	8	5	8
8519, 8520	4	8	4	8	4	8
8908, 8909	1	3	1	3	1	3
8915	4	8	4	8	4	8
1920DR	4	8	4	8	4	8
9720UV	4	8	4	8	4	8
9720i	4	8	4	8	4	8
none	3	3	3	3	3	3

Graphic Protection	EFI™		3M		Durst	
	VUTEk® PV200		Printer 2500UV		Rho 160R and 351R	
	Ink Series 2200UV		Ink Series 2600UVv2		Ink Series 2700UV	
Graphic Protection	Use IJ Films		Use IJ Films		Use IJ Films	
	outdoor	indoor	outdoor	indoor	outdoor	indoor
3619, 3620	5	8	5	8	5	8
8519, 8520	4	8	4	8	4	8
8915	4	8	4	8	4	8
1920DR	—	—	4	8	—	—
9720UV	4	8	4	8	4	8
9720i	4	8	4	8	4	8
none	3	3	3	3	3	3

Graphic Protection	EFI™		HP		Mimaki	
	VUTEk® QS2000, QS3200		Designjet H35000/H45000		UJV-160	
	Ink Series 2800UV		Ink Series 5400UV		Ink Series LF-200	
Graphic Protection	Use IJ Films		Use IJ Films		Use IJ Films	
	outdoor	indoor	outdoor	indoor	outdoor	indoor
3619, 3620	5	8	5	8	—	—
8519, 8520	4	8	4	8	3	8
8915	4	8	4	8	3	8
1920DR	—	—	—	—	—	—
9720UV	4	8	4	8	—	—
9720i	4	8	4	8	—	—
none	3	3	3	3	2	3

3M™ MCS™ Warranty
for Non-Vertical and
Desert Southwest

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

Exposure	Percentage of U.S. Vertical Exposure	Example
Desert Southwest - Vertical	70% (0.7)	0.7 x 4 years= 2.8 years

3M Performance Guarantee
Graphic Constructions and
Durability
For 3M Product Performance Only

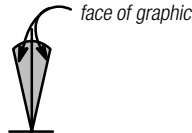
Graphics constructed as described in the table below are eligible for the 3M Performance Guarantee when exposed in a vertical exposure in the United States. This warranty covers the performance of only the recommended 3M products used in the graphic construction when imaged with the printers and OEM inks listed in the most current version of Product Bulletin PG Matrix. That Bulletin may also list certain restrictions for using the film covered in this Bulletin. 3M will honor the warranty given in the version of this Bulletin that was current at the time you purchased the film.

Film	Graphic Protection	Vehicle, Outdoor, Indoor Warranty in Years	Inks and Printers
IJ3650-10 IJ3650-114	8518 8519 8520 1920DR 9720UV	2	See Product Bulletin PG Matrix

Warranty Notes

Definitions

Vertical Exposure



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

Desert Southwest

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.

Vehicles

Refers to commercial fleet, buses, vans and automobiles unless otherwise noted.

Graphic Performance Life

The actual performance life of a graphic is affected by all of the following.

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

Application Outside the U.S.

Contact the 3M organization for that country.

Graphics Made with Components Not Sold or Recommended by 3M

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

The 3M Performance Guarantee covers selected 3M graphic products when used with qualified printers and OEM inks. See Product Bulletin: PG Matrix.

Application to Glass

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

Graphic Protection

Any graphic exposed to abrasive conditions (including vehicles), harsh cleaners or chemicals must include graphic protection in order to be warranted. Abrasion damage and gloss loss are not covered.

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.

Piezo Inkjet Printing

Ink

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

Backlit Signs Require Special Consideration

Clear films (color -114) tend to be more sensitive to shrinkage due to high total ink coverage. Film that is not sufficiently dried prior to creating an overlap may shrink and result in a light leak. Rather than increasing the total ink coverage to increase the density of the backlit image, we recommend printing two layers of film at lower ink levels. Refer to Instruction Bulletin 4.26 for details and construction options.

Total Ink Coverage

The maximum recommended total ink coverage for this film is:

270% when printed with all approved 3M piezo solvent inks.

280% when printed with all approved 3M UV inks.

250% when printed on the Mimaki JV5 Series printer with HS ink series (Performance Guarantee).

Too high a total physical ink amount on the film results in media characteristic changes, inadequate drying, overlamine lifting, and/or poor graphic performance. Refer to the Instruction Bulletin for the ink system being used for additional details about total ink coverage.

Graphics Manufacturing

Important Note!

Adequately Dry Graphics

Inadequate drying can result in graphic failure including curling, increased shrinkage and adhesion failure, which are not covered under warranty.

Always build enough time into your process to ensure adequate drying of the graphic. Poorly dried film may become soft and stretchy, and the adhesive may become too aggressive. This can cause difficulty when applying an overlamine, rolling the graphic, and applying the film. See the ink's Instruction Bulletin for more details.



Before using any equipment, always follow the manufacturers' instructions for safe operation.

Graphic Protection

Graphic protection can improve the appearance, performance and durability of your graphic.

- Clear 8530 must be applied with a liquid laminator.
- Overlaminates must be cold roll applied.

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 this film are based on upper case Helvetica medium type. Weeding is much more difficult with smaller text.

- Minimum stroke width: 0.19 inch (4.76 mm)
- Minimum height: 1.0 inch (25.4 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 the film elements. Then locate the graphic protection on your graphic in the table below, and use the corresponding tape. See Instruction Bulletin 4.3 for complete details.

EXAMPLE: If the film is protected by overlamine 8519 and you want to premask the film, use premasking tape SCPM-3.

Tape	Graphic Protection					
	None	3619, 3620 8519, 8520 8518	8908 8909	8530	1920DR	9720i 9720UV
Premasking SCPM-3	■ ¹	■	■	■	■	
Prespacing SCPS-2	■ ¹	■	■	NR	NR	
Premasking SCPM-44X	■ ²					■
Prespacing Tape SCPS-53X	■ ²					■

Refer to the Warranty tables to determine what graphic protection is approved for your graphic construction.

NR= Prespacing and/or premasking it not recommended when using this graphic protection option.

1. All solvent inks.

2. All UV inks.

Application and Installation

Finishing

Refer to the 3M Related Literature section for a list of the Instruction Bulletins that may be needed to apply or install this film.

This film does not require edge sealing. However, applications such as cut graphics, may benefit from using 3M™ Edge Sealer 3950.

Cleaning Graphics

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.)

Refer to Instruction Bulletin 6.5 for general maintenance and cleaning information.

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.

Shelf Life, Storage and Shipping

Shelf Life

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

Storage Conditions

- 40° to 100°F (4° to 38°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.

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 following applicable Bulletins provide information and processes you need to properly make the graphics described in this Bulletin. 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™ Piezo Inkjet Ink Series 1500v2	PB-IB	1500
3M™ Piezo Inkjet Ink Series 4400	PB-IB	4400
3M™ Piezo Inkjet Ink Series 4600	PB-IB	4600
3M™ Piezo Inkjet Ink Series 4800	PB-IB	4800
3M™ Piezo Inkjet Ink Series 5500	PB-IB	5500
3M™ Piezo Inkjet Ink Series 6000	PB-IB	6000
3M™ Piezo Inkjet Ink Series 6800	PB-IB	6800
3M™ Piezo Inkjet Ink Series 2200UV	PB-IB	2200UV
3M™ Piezo Inkjet Ink Series 2600UVv2	PB-IB	2600UV
3M™ Piezo Inkjet Ink Series 2700UV	PB-IB	2700UV
3M™ Piezo Inkjet Ink Series 2800UV	PB-IB	2800UV
3M™ Piezo Inkjet Ink Series 5400UV	PB-IB	5400UV
Mimaki Ink Series LF-200	PB-IB	LF200
Mimaki Ink Series F-200	PB-IB	F200
3M™ Scotchcal™ Luster Overlamine 3619 and Matte 3620	PB	3619/3620
3M™ Scotchcal™ Gloss Overlamine 8518	PB	8518
3M™ Scotchcal™ Luster Overlamine 8519 and Matte 8520	PB	8519/8520
3M™ Scotchcal™ Luster Overlamine 8908 and Matte 8909	PB	8908/8509
3M™ Screen Print Gloss Clear 1920DR	PB	1900
- Applying screen printing clear 1920DR	IB	3.12
3M™ Screen Print Gloss Clear 9720UV and Matte Clear 9730UV	PB	9700
-Applying screen printing clear 9720UV or 9730UV	IB	3.4
3M™ Screen Print UV Gloss Clear 9720i	PB-IB	9720i
Scoring and cutting	IB	4.1
Cold roll lamination	IB	4.22
Using 3M application tapes; premasking and prespacing for films	IB	4.3
Making backlit signs with 3M digitally imaged graphics	IB	4.26
Application, substrate selection, preparation and substrate-specific application techniques	IB	5.1

Subject	Type	Bulletin No.
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Storage, handling, maintenance, removal	IB	6.5
3M Graphics Center Warranty Brochure	go to www.3Mgraphics.com	

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Bulletin Change Summary

New Compatible Products: Ink series 4400, LF-200, F-200; Overlaminates 3619, 3620.
Total Ink Coverage recommendations: 270% (solvent inks), 270% (UV inks).



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