3M™ Scotchlite™ Reflective Graphic Film Series 680

Product Description

Scotchlite *Plus* 680 is a highly durable, flexible, enclosed lens reflective sheeting designed for the production of attractive multicoloured markings, displays, signs, truck markings and other markings which have the same appearance in the day-time and at night even when viewed at side entrance angles. This sheeting is intended for application to flat surfaces with and without rivets and for use on corrugated surfaces.

Key Features

- Similar daytime and nighttime appearance
- Excellent angularity
- Retains 90% of its retro-reflectivity when totally wet
- Positionable, pressure-activated adhesive
- Available in 11 colours.
- 680-85 has a black daytime appearance but reflects white at night
- Suitable for Screen printing and electrostatic imaging.*
- Up to 8 years exterior warranty
- Unprocessed film resists fuel vapors or occasional spills

*** For piezo ink jet printing use IJ680-10**

Applications and Uses

Film Series 680 is intended for making durable graphics when used with the listed Compatible Products in the following applications. These applications are warranted by the 3M™ MCS™ Warranty.

- Commercial vehicle graphics, railway graphics, commercial signs, and striping

Limitations of End 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:

- Permanent, regulatory traffic signs
- 3M Commercial Graphics Division products are not tested against automotive manufacturers' specifications and are, therefore, not warranted for use in fabricating graphics for automotive Original Equipment Manufacturers (OEM).

Product Line

Product Number	Colour
680-10	White
680-14	Orange
680-64	Gold
680-71	Yellow
680-72	Red
680-75	Blue
680-76	Light Blue
680-77	Green
680-81	Lemon Yellow
680-82	Ruby Red
680-85	Black (reflects white)

Custom colour matching is available on this product.

Contact the 3M Sales Office.

Compatible Products

Screen Printing Inks

3M™ Screen Printing Ink Series 1900
line and four colour

3M™ Scotchlite™ Screen Printing Ink Series 2900
line colour

3M™ Screen Printing UV Ink Series 9800
line colour and four colour

Screen Printing Graphic Protection Options

3M™ Screen Print Gloss Clear 1920DR

3M™ Screen Print Gloss Clear 9720UV

3M™ Screen Print UV Gloss Clear 9800CL

Electrostatic Imaging

Scotchprint® Toner Series 8700/8800 ES

3M™ Trident Transfer Media ES

Electrostatic Imaging Graphic Protection Options

3M™ Scotchcal™ Luster Overlaminate 8519

3M™ Scotchcal™ High Gloss, Graffiti Resistant Overlaminate 8912 (not for use on rivets)

- Selected 3M application tapes

Main Characteristics

Property	Description
Film Type	Composite
Film Opacity	Opaque
Adhesive type	Pressure activated, positionable,
Adhesive colour	Clear
Liner	94 pound, polyethylene-coated paper
Suitable application surface	Flat, moderately curved or corrugated surfaces with or without rivets
Suitable application substrates	Aluminum, GRP, stainless steel, paint
Application temperature range*	10º to 38ºC flat surfaces without rivets 13º to 38ºC (45º to 100ºF) flat, curved or corrugated surfaces with rivets

*****_For applications nearing the minimum temperature range, please contact your local technical service representative to confirm suitability of application_

Other Characteristics

Retroreflection

At a –4º entrance angle and a 0.2º observation angle, unprinted film series 680 has the following typical coefficient of retroreflection. It is expressed in candlepower per foot-candle per square foot (candela/lux/square meter) per ASTME 810.

The entrance angle is formed by a light beam striking the surface at a point and at a line that is perpendicular to the surface at the same point.

An observation angle is formed by the light beam striking the reflective surface and returning to the observer. From 245 metres(800 feet), a motorist normally views a graphic at a 0.2º angle.

Film and Colour	Typical Coefficient of Retroreflection
680-10 White	100
680-14 Orange	25
680-64 Gold	65
680-71 Yellow	60
680-72 Red	20
680-75 Blue	10
680-76 Light blue	10
680-77 Green	15
680-81Lemon Yellow	40
680-82 Ruby Red	20
680-85Black	30

Chemical and Physical Properties

Values given are typical and are not for use in specifications. If a custom specification is desired, a request should be submitted through your sales representative. The data given below is for unprinted film

Chemical Resistance

- Resists mild acids, mild alkalis and salts
- Excellent water resistance
- Resists occasional fuel spills

Physical Properties

Property	Metric Units
Thickness (film plus adhesive)	0.18 to 0.20 mm
Tensile Strength (ISO 1184-1983)	44N/25mm at 23ºC
Applied shrinkage	0.4 mm
Service temperature range	-34º to +93ºC

Adhesion (FTM1)

Substrate	Metric Units *N/25mm*
Aluminum, anodized	22
Aluminum, etched	22
GRP	17
Fruehauf painted panels	20
Stainless steel	24

These adhesion values are 24 hours after application.

Note: ISO refers to standards of the International Standards Organisation. FTM (Fimat Test Methods) refers to test methods listed by Fimat, the Association of European Tape Manufacturers.

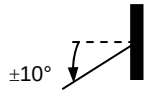
Warranty

Only a Scotchprint® Graphics Authorised Manufacturer or 3M™ MCS™ Qualified Manufacturer can produce 3M™ MCS™ Warranted Graphics. The warranty period is based on field experience and exposure tests. 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 and ink
- Ink formulation
- Drying methods
- Selection and preparation of the substrate
- Application methods
- Exposure conditions
- Cleaning methods

Warranted Durability

The following tables show the warranties for exposure where the face of the graphic is vertical at 90° ± 10°.



Ink Series	Protective Clears	Fleet			Exterior Sign 1st Surface			Interior		
ZONE		**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Unprinted	Unprinted	8	7	5	8	7	5	8	8	8
1900/2900/9800	1920/9720	8	7	5	8	7	5	8	8	8
1900/2900/9800	9800CL	6	4	3	6	4	3	8	8	8
8700/8800 Toners	8519	6	5	4	5	4	3	8	8	8
	8912	5	4	3	5	4	3	8	8	8
	1920	5	4	3	4	3	2	8	8	8

Warranty Limitations

- Film series 680 is not warranted for non-vertical applications ($90^{o} \pm 10^{o}$). Film that is exposed at angles grater than this may have a shorter life. The customer must assume the responsibility for testing and approving other exposures.
- Long exposure to continuous high heat decreases the effective performance life of this film by 2 years. High heat is a temperature above 65ºC (150ºF). It may occur in areas such as railway locomotives, vehicle engine compartments, non-insulated tankers exposed to frequent internal steam cleaning, or compartments that carry hot cargo.
- Overlaminate 8912 ES is only recommended for flat surfaces without rivets.

Zone 1: Northern and Central Europe
Austria, Baltic States, Belgium, Bosnia, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greenland, Hungary, Iceland, Ireland, Italy (North of Rome), Liechtenstein, Luxembourg, Netherlands, Norway, Poland, Romania, Serbia, Slovakia, Slovenia, Sweden, Switzerland, UK

Zone 2: Mediterranean Europe
Albania, Bulgaria, Corsica, Crete, Greece, Italy (South of Rome), Macedonia, Malta. Portugal, Russia, Sardinia, Spain, Turkey

Zone 3: Middle East and Africa
Afghanistan, Bahrain, Cyprus, Dubai, Israel, Kuwait, Iran, Iraq, Jordan, Lebanon, Oman, Pakistan, Qatar, Saudi Arabia, Syria, UAE, Yemen Algeria, Angola, Benin, Botswana, Burkina, Burundi, Cameroon, CAR, Chad, Congo, Djibouti, Egypt, Eritrea, Gabon, Ghana, Guinea, Ivory Coast, Libya, Liberia, Madagascar, Mali, Mauritania, Morocco, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somali Republic, South Africa, Sudan, Togo, Tunisia, Uganda, Zaire, Zambia, Zimbabwe

Fabrication

This bulletin does not contain detailed printing, processing or application procedures for the subject products. The appropriate Instruction Bulletin(s) may be obtained by contacting your 3M sales representative or 3M Technical Service.

Screen Printing

Durability

To obtain the durability given in the warranty table, use only approved combinations of ink or toner and overprint clear or overlaminate.

Formulations and processing conditions can affect the durability of the ink. Carefully follow the limitations of the specific inks and the instructions in the appropriate Product and Instruction Bulletins. Refer to the 3M Related Literature section.

Ink Considerations

- Ink series 1900 (line colours) are opaque. Be aware that they prevent the film from retro-reflecting in the screen printed areas.
- Do not use inks containing metallic pigments.
- Film 680-10 is modified for enhanced performance with ink series 9700 UV.
- Ensure the last colour and the overprint clear are properly dried when using solvent-based inks on graphics needed for any corrugated application.

Digital Printing

Refer to the 3M Related Literature section for Instruction Bulletins that discuss digital printing methods.

Cutting

⚠ Caution
When using any equipment, always follow the manufacturers' instructions for safe operation.

Recommended Cutting Methods

- Band sawing
- Hand cut
- Hot kiss cutting
- Guillotine
- Cold and hot steel-ruled die cutting
- Drum-type electronic cutting
- Flat-bed electronic cutting

Weeding Considerations

Electronically-cut graphics may be difficult to cut and weed. The customer must assume responsibility for testing and approving this cutting method.

Weed the film within 24 hours of cutting it. The adhesive may flow after cutting.

Perform weeding carefully. Cut graphics do not re-adhere to the Comply performance liner if they are pulled off of it. For this same reason, do not attempt to exchange the liner.

Refer to Instruction Bulletin 4.1 for more details.

Design Factors

- Use a minimum letter height of 75mm (3 inches).
- Use a minimum stroke width of 10mm(3/8 inch).
- Use a minimum radius for a point of 1.6mm (1/16 inch).
- For uniform colour and brightness when making a graphic with multiple pieces of film series 680 together, be sure the pieces are properly colour matched. See Instruction Bulletin 2.1 for details. Colour-matched film is available by special order. Contact your 3M sales representatives.
- Order "roll applicator splices" for roll striping. Butt splices may have a small gap.

Application Tapes

The type of application tape to use depends on the type of graphic produced and the ink/toner and overprint clear/overlaminate used. Refer to Instruction Bulletin 4.3 for more details.

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

Overprint Clear or Overlaminate	Premask Tape	Prespace Tape
Unprinted film	SCPM-19	SCPS-100
1920DR	SCPS-100	SCPS-100
9720 UV	SCPM-44X	SCPM-44X
9800CL	SCPM-44X	SCPM-44X
8519 8912	None required, but may use SCPM-19	SCPS-100

Application

The application details given below apply to film series 680. Use them in conjunction with complete application information found in our Instruction Bulletins. Refer to the 3M Related Literature section near the end of this bulletin.

Temperature

- 10º to 38ºC flat surfaces without rivets
- 13º to 38ºC
  flat, curved or corrugated surfaces with rivets

Positioning

This film has a positionable adhesive. This 3M technology is a mechanical feature, not an adhesive property. Application pressure bonds the adhesive to the substrate and destroys the positionability feature.

This film loses its positionability feature at application temperatures above 38ºC.

Refer to the Instruction Bulletin 5.4 for application details.

Application Method

Use a dry method. Do not use a detergent and water or a commercial application liquid to position the graphic.

Substrate

- Some substrates such as under-cured polyurethane paint, fibreglass, and some paint systems may continue to outgas for some time. Two-part polyurethane paints and clear coats may stop curing when the air and surface temperatures are lower than 24ºC.
- Film series 680 can be applied over other recommended 3M graphic systems

Finishing Overview

- If needed, use edge sealer 3M™ Edge Sealer 4433.
- Most graphics made with film series 680 do not require an edge sealer, although certain applications may benefit from its use.
- All processed and unprocessed graphics subjected to fuel vapors or occasional fuel spills do require edge sealer.
- Edge sealing in the following applications is not required, but it may help keep the edges adhered when subjected to external sources such as abrasion and/or high pressure washing.
  - graphics exposed to severe abrasion or high pressure washing (see Note, below)
  - graphics applied to chrome substrates
  - graphics applied to locomotives and rail rolling stock
  - graphics applied to truck rollup doors

Note: Refer to Instruction Bulletin 6.5 for details on pressure cleaning. Exceeding 3M's recommendations will void the warranty whether or not an edge sealer was properly used.

Maintenance and Cleaning

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).

Shelf Life

- The shelf life of the film is 2 years and should be applied within 2 years of the receipt of film if unprocessed. Processed film should be applied within 1 year of processing and within 2 years of receipt of the film.
- Leave the rolls of film in the original shipping carton or suspend the rolls horizontally.
- Store cut sheets lying flat.
- Store the film and the processed graphics in a clean, dry area and away from direct sunlight at a temperature below 38°C.
- Ship the finished graphics lying flat or in a roll. To roll the graphic, wrap it film-side-out on a minimum 15 cm(6 inch) diameter core. These methods help prevent the film and premasking from wrinkling or popping off the liner.

Related 3M Literature

Listed below is related 3M Technical Literature which may be of interest:

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Subject	Product Bulletin	Instruction Bulletin
Design of Markings		2.1
3M™ Scotchlite™ Transparent Screen Printing Ink Series 2900	2900	3.18
3M™ Screen Printing Ink Series 1900 Line	1900	3.12
3M™ Screen Printing Ink Series 1900 4-Colour Half Tone Inks	1900	3.11
3M™ Screen Printing Ink Series 9700UV Line	9700	3.4
3M™ Screen Printing UV Ink Series 9800	9800	3.20, 3.21
3M™ Scotchcal™ Lustre Overlaminate 8519	8519	
3M™ Scotchcal™ High Gloss Overlaminate 8912	8912	
Scoring and Cutting		4.1
Premasking and Prespacing		4.3
Surface Preparation		5.1
Application		5.4, 5.5
Storage, Maintenance and Removal		6.5
Warranty of Products		

Glossary of Terms

Matched Component System™ or **MCS™**
The system pursuant to which Finished Graphics are produced by a Graphic Manufacturer using only 3M Products and components and manufactured in accordance with 3M's Product or Instruction Bulletins, 3M Specification Document and using 3M Approved Technologies.

3M™ Controltac™ *Plus*
A film with 3M™ Controltac™ *Plus* positionable adhesive system has million of precision-placed microscopic glass spheres embedded within its adhesive layer. These spheres help to prevent the adhesive from fully contacting the application surface until pressure is applied. This enables the graphic to be positioned, then re-positioned as many times as necessary, until it is in exactly the right place before final application.

Retroreflectivity
A retroreflective material reflects the incoming light back to the light source. Scotchlite reflective graphics reflect the car headlights back to the car driver.

Permanent Adhesive
Films with a permanent adhesive can be difficult to remove and will often require heat and/or chemicals for effective removal.

Health & Safety

Refer to the package label and the Material Safety Data Sheet for health, safety, and handling information on the products referenced in this bulletin. For 3M products, if necessary, you may contact our Toxicology/Product Responsibility Department on 01344 858000.

Important Notice to Purchaser

The 3M products described in this publication are covered by a 3M warranty and limitation of liability.

3M's warranty provides that if 3M finds that goods are defective in material or workmanship they will be replaced or the price refunded at 3M's option but note that 3M does not accept liability for other direct losses (except for personal injury or death) or consequential losses relating to defective products or from information supplied by 3M.

Purchasers and users of 3M products, and not 3M supplying companies, are always solely responsible for deciding on the suitability of the 3M product for their required or intended use.

Technical Assistance

For help on specific questions relating to 3M Commercial Graphics Division Products, contact your local Technical Service Representative.
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e-mail: commgraphics.uk@mmm.com
internet: www.3m.com/uk/graphicsolutions
internet: www.scotchprint.com/uk

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Bulletin Change Summary

3M™ Screen Printing Ink Series 9700UV replaced with 3M™ Screen Printing UV Ink Series 9800. Warranty table updated.

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