



Scotchlite™

Reflective Sheeting Series 280

Description

Advantages

- Designed for imaging and electronic cutting with Gerber Scientific Equipment
- Long term, exterior durability
- Pressure-sensitive adhesive
- Durable, flexible, enclosed-lens, retroreflective film
- Retains 90% of its retroreflectivity when totally wet
- Similar daytime and nighttime appearance
- 3M™ Scotchlite™ Reflective Film 280-85 has a black daytime appearance but reflects white at night
- Resists cracking in cold climates

Applications and Uses

Scotchlite reflective sheeting series 280 is intended for making permanent, 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, commercial signs and striping

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 sheeting for the following:

- Regulated traffic signs
- Application to corrugated surfaces
- Application to stainless steel
- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684, Ext. 444, for alternatives.

Compatible Products

- 3M™ Premask Tape SCPM-3
- 3M™ Prespace Tape SCPS-2
- 3M™ Scotchlite™ Edge Sealer 4433

Product Line

This information is subject to change. Be sure this is the most current Product Bulletin. See 3M Related Literature at the end of this bulletin.

Characteristic	Description
Product number and color	280-10 White 280-14 Orange 280-64 Gold 280-71 Yellow 280-72 Red 280-75 Blue 280-76 Light blue 280-77 Green 280-81 Lemon yellow 280-82 Ruby red 280-85 Black
Thickness (film and adhesive)	0.007 to 0.008 inch (0.18 to 0.20 mm)
Adhesive color and type	Clear, pressure-sensitive
Liner	78 pound, white kraft paper
Application surfaces	Flat, flat with rivets, or moderate curves
Application substrates	Acrylic, aluminum, fiberglass, FRP paint
Application temperature range (for air and substrate)	55° to 100°F (13° to 38°C) flat surface without rivets 60° to 100°F (15° to 38°C) flat surface with rivets
Removability	Permanent

Effective Performance Life

The effective performance life is based on field experience and exposure tests conducted throughout the United States. When the graphics are processed and used according to 3M recommendations, they should have the following performance life. The actual performance depends on the:

- Selection and preparation of the substrate
- Application methods
- Exposure conditions
- Cleaning methods

Effective Performance Life continued on the next page.

Warranted Durability

3M™ Scotchlite™ Reflective Sheeting Series 280	Overprint or Protective Clear	Vertical Exposure <i>face of graphic is vertical ± 10°</i>				Non-Vertical Exposure <i>face of graphic is 10° to 45° from vertical</i>			
		All film colors except 280-85		Film 280-85		All film colors except 280-85		Film 280-85	
		U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years	U.S. ¹ years	S.W. ² years
Vehicle Applications									
Unprinted film	None	7	5	5	4	5	-	3	-
Commercial Signs and Non-vehicle Applications									
Unprinted film	None	5	3	4	2	-	-	-	-
Railroad Applications									
Unprinted film	None	5	4	5	4	3	-	3	-

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 that are exposed more than 50% of the time in the U.S. Desert Southwest.

Warranty Limitations

- 3M does not warrant sheeting series 280 for non-vertical applications greater than 45° from vertical. Film that is exposed at these angles may have a shorter life. The customer must assume the responsibility for testing and approving non-vertical exposures.
- Long exposure to continuous high heat decreases the effective performance life of this film by 2 years. High heat is a temperature above 150°F (65°C). It may occur in areas such as railroad locomotives, vehicle engine compartments, non-insulated tankers exposed to frequent internal steam cleaning, or compartments that carry hot cargo.

Cutting

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

Recommended Cutting Methods

Sheeting series 280 can be cut with any Gerber Scientific Products computer-driven cutting equipment. Before starting a cutting operation, consider these factors:

- Cutting and weeding capabilities of your equipment
- Font characteristics
- Physical stresses to which the graphic may be exposed

Design Factors

- Use a minimum letter height of 2 inches (5 cm).

- Use a minimum stroke width of 3/8 inch (1.0 cm).
- For uniform color and brightness when making a graphic with multiple pieces of sheeting series 280 together, be sure the pieces are properly color matched. See Instruction Bulletin 2.1 for details.

Factors That Affect Electronic Cutting Quality and Ability

- **Sharpness of the knife blade.** Dull blades create a serrated look on the edge of the cut film.
- **Weight on the knife blade.** The ideal weight results in a slight scoring of the liner. Too little weight results in incomplete cutting through the film and adhesive. Too much weight cuts the liner. It also causes the blade to drag, which accelerates wear, and eventually creates a serrated cut edge on the film.
- **Weeding.** Weed the film within 24 hours of cutting it. The adhesive may flow after cutting.

Prespacing and Premasking

The application tape to use depends on the type of graphic produced. See Instruction Bulletin 4.3 for details.

- For graphics that have a large amount of exposed liner, and/or small letters and/or narrow stroke width, use prespace tape SCPS-2.
- For graphics that have very little exposed liner, and/or large letters, and/or wide stroke width, use premask tape SCPM-3.

Application

- 3M™ Scotchlite™ Reflective Sheeting Series 280 is not positionable. Refer to Instruction Bulletin 5.5 for applying graphics with a pressure-sensitive adhesive.
- Do not apply graphics if the air or surface temperature is less than 55° F (13°C) on a flat surface without rivets, or 60°F (15°C) on a flat surface with rivets.
- At surface temperatures greater than 80°F (27°C), the film may pre-adhere to the application surface.
- Some substrates such as under-cured polyurethane paint, fiberglass, 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 below 75°F (24°C). Be aware that outgassing causes this film to bubble.

Edge Sealing

- 3M™ Scotchlite™ Edge Sealer 4433 is recommended for this film.
- Use edge sealer on processed and unprocessed graphics subjected to gasoline vapors or occasional gasoline spillage.
- Edge sealing is not required in the following applications, but it can help prevent edge lifting caused by external sources such as aggressive pressure washing. Use edge sealer 4433.
 - graphics subjected to severe abrasion or high pressure spray cleaners
Exceeding 3M's pressure washing recommendations, as stated in Instruction Bulletin 6.5, will void the 3M warranty whether or not the graphic has been edge sealed.
 - graphics applied to truck roll-up doors
 - graphics applied to chrome

Removal

Warning

Solvents may ignite near heat or an open flame. To reduce the risk of a flash fire and serious injury, do not use heat sources near solvents.

Sheeting series 280 is not a removable product. Heat helps take off the top layer, but removing the adhesive requires a solvent-based remover.

Refer to Instruction Bulletin 6.5 for more details.

Shelf Life and Storage

- The shelf life of the sheeting cannot exceed 2 years from the date of receipt from 3M.
- Leave rolls of sheeting in the original shipping carton, or suspend the rolls horizontally.
- Store cut sheets lying flat.
- Store the sheeting in a clean, dry area, away from direct sunlight, and at a temperature less than 100°F (38°C).
- Ship the finished graphics lying flat or in a roll. To roll the graphic, wrap it sheeting-side-out on a minimum 6 inch (15 cm) diameter core. These methods help prevent the sheeting and premask from wrinkling or popping off the liner.

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

The values given are typical for sheeting series 280 and are not for use in specifications. The data given below are for sheeting as purchased from 3M.

Retroreflection

At a -4° entrance angle and a 0.2° observation angle, unprinted sheeting series 280i has the following typical coefficient of retroreflection. It is expressed in candlepower per foot-candle per square foot (candela/lux/square meter) per ASTM E 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 800 feet (249 meters), a motorist normally views a graphic at a 0.2° angle.

Film and Color	Typical Coefficient of Retroreflection
280-10 White	100
280-14 Orange	25
280-64 Gold	65
280-71 Yellow	60
280-72 Red	20
280-75 Blue	10
280-76 Light blue	10
280-77 Green	15
280-81 Lemon yellow	40
280-82 Ruby red	20
280-85 Black (reflects white)	30

These charts are for 3M™ Scotchlite™ Reflective Film Series 280.

Physical Properties

Property	English Units	Metric Units
Thickness (sheeting and adhesive)	0.007 to 0.008 inch	0.18 to 0.20 mm
Service temperature range	-30° to +200°F	-34° to +93°C
Applied shrinkage	0.015 inch	0.4 mm
Tensile strength	11 pound/inch at 73°F	2.0 kg/cm at 23°C

Adhesion Characteristics

(24 hours after application)

Substrate	English Units pounds/inch	Metric Units kg/cm
Aluminum, anodized	5.0	0.9
Aluminum, etched	5.0	0.9
FRP	3.9	0.7
Fruehauf prepainted panels	4.5	0.8

Chemical Resistance Characteristics

- Resists mild acids, mild alkalis, and salts
- Excellent water resistance

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 280 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 material charges.

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.
Instruction Bulletins		
Design of markings	2.1	5501
Scoring and cutting	4.1	6501
Premasking/prespacing	4.3	6503
Surface preparation -Non vehicular -Vehicular	5.1 5.2	7001 7002
Application to flat and curved surfaces, markings with pressure sensitive adhesive	5.5	7005
Storage, 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
3M MCS Graphics Warranty for Fleet Vehicle Applications (includes overview)		9506
Other 3M Literature		
Multi-Color Graphics Assembly	75-5100-0776-0	

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GerberColor is a trademark of Gerber Scientific Products.



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