

Transportation Safety Division

3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000

Product Bulletin 4000
March 2023

Replaces Product Bulletin Series 4000 Dated August 2019

1 Description

3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000 (“Sheeting”) is a full cube retroreflective prismatic sheeting that has been designed for production of traffic control and guidance signs (“Signs”) that are exposed vertically in service.

For details of the features and benefits of the Sheeting, please refer to the 3M Transportation Safety Division website (<http://www.3M.com/roadsafety/>).

The Sheeting is available in the following colors.

Table 1. Product codes by color.

Color	Product Code
White	4090
Yellow	4091
Red	4092
Blue	4095
Green	4097
Brown	4099
Fluorescent Yellow - FY	4081
Fluorescent Yellow-Green - FYG	4083
Fluorescent Orange - FO	4084

2 Specifications

The Sheeting conforms to all current performance requirements of ASTM D4956 for Type IX and Type XI retroreflective sheeting. Refer to section 7 for information regarding imaging of Sheeting.

3 System of Matched Components

For a complete list of matched components for the Sheeting, please see the [3M™ Sign Warranty Bulletin](#).

4 Physical Properties

4.1 Adhesive

Sheeting comes with a pressure-sensitive adhesive that is recommended for application at temperatures of 65 °F (18 °C) and higher. Meets ASTM D4956 Class I adhesive requirement.

4.2 Entrance Angularity Performance with Respect to Orientation

Sheeting has been designed to be an effective wide angle reflective sheeting regardless of its orientation on the substrate or the ultimate orientation of the Sign after installation. However, because the efficiency of light return from cube corner reflectors is not equal at all application orientations, especially at higher entrance angles, it is possible to get the widest entrance angle light return when the Sheeting is oriented in a particular manner. Sheeting orientation can be used to easily optimize high entrance angle (>50°) performance when it is required for a given Sign (e.g. “keep right” symbols). In such situations, the completed Sign should have the Sheeting positioned at the 0° orientation (downweb direction perpendicular to the road). When the “primary groove line” (which is oriented parallel to the flat sides of the diamond chain links) is vertical on the completed Sign, Sheeting is said to be in a 0° orientation. When the “primary groove line” is horizontal on the completed Sign, the Sheeting is said to be in a 90° orientation. See Figure 1 for details.

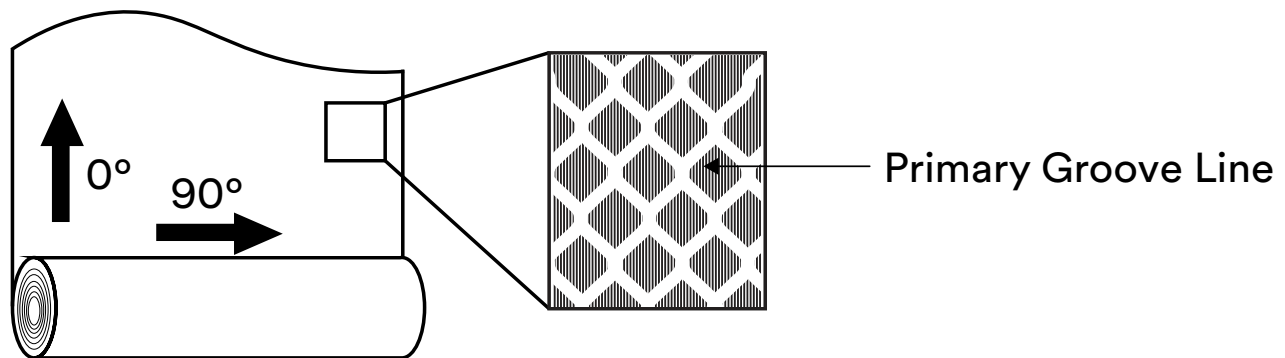


Figure 1. Primary groove lines used to define Sheeting orientation.

Unless a Sign’s location and/or position calls for extra-wide entrance angularity performance or a specific installation direction is required in a customer specification, Signs and applied copy (letters, arrows, borders, and shields) can be fabricated and installed using the application orientation that most efficiently utilizes the reflective Sheeting.

Note: For multi-panel Signs, it is recommended that all background panels be applied with the Sheeting oriented in the same direction.

Sheeting may be processed into traffic Signs using any of the imaging methods described below. 3M assumes no responsibility for the failures of Sign face legends or backgrounds that have been processed with non-3M process colors or with matched component imaging materials other than those listed below.

5 Substrates

Refer to [3M Information Folder 1.7](#) for surface preparation recommendations.

Sheeting has been designed primarily for application to flat substrates. Any application to a substrate with a radius of curvature of less than five inches should also be supported by rivets or bolts. Plastic substrates are not recommended where cold shock performance is required. **Sign failures caused by substrate failures or improper surface preparations are not the responsibility of 3M.**

6 Sign Fabrication Methods

6.1 Squeeze Roll Application

Sheeting should be applied to Sign substrates at temperatures of 65 °F (18 °C) and higher using either of the following methods:

Mechanical squeeze roll applicator – refer to [3M Information Folder 1.4](#). Applications to extrusions that are edge wrapped require sufficient softening of the Sheeting prior to edge wrapping. Softening can be accomplished by directing additional heat to the “next to last” edge roller. This practice may increase productivity and minimize cracking.

Hand squeeze roll applicator – refer to [3M Information Folder 1.6](#) for details.

Background and complete Sign applications of Sheeting must be performed using a roll laminator, either mechanical or hand driven.

6.2 Hand Application

Hand application is recommended for legend and copy only. Refer to [3M Information Folder 1.5](#) for more details.

Hand applications will show some visual irregularities which may be objectionable to aesthetically critical customers. These irregularities are more noticeable on darker colors. To obtain a uniform close-up appearance, a roll laminator must be used.

All direct applied copy and border **MUST** be cut and squeegeed at all metal joints.

6.3 Splices

Sheeting must be butt spliced when more than one piece of Sheeting is used on a single piece of substrate. Sheeting pieces should not touch one another. Avoiding overlap prevents the buckling that can occur as Sheeting expands under extreme temperature and humidity conditions.

6.4 Double Faced Signs

The Sheeting on the bottom side of a double faced Sign can be damaged if rolled through a squeeze roll applicator using an unprotected steel bottom roller. The use of a semi-soft flat sheet between the steel roller and the applied Sign face will protect the Sign face from damage. Use of a rubber mat, tag board, or cardboard is recommended.

7 Imaging

Sheeting may be processed into traffic Signs using the imaging methods described below. Compatibility is backed with a 3M™ MCS™ Warranty or 3M™ MCS™ Warranty for Traffic when the printing guidelines referred to in the Literature References of Section 15 are followed. See Section 13 of this document for more information regarding the warranties. 3M assumes no responsibility for the failures of Sign face legends or backgrounds that have not been processed according to the [3M Sign Warranty Bulletin](#).

7.1 Digital Imaging

Sheeting is compatible with 3M qualified latex inkjet printers and ink systems. Refer to [3M Information Folder 1.17](#) and [HP Large Format Printing Knowledge Center](#) for details. Use of 3M™ ElectroCut™ Film 1170C or 3M™ Premium Protective Overlay Film Series 1160i is required.

7.2 Screen Processing

Sheeting may be screen processed into traffic Signs using 3M Process Colors Series 880I or Series 880N before or after mounting onto Sign substrates. Refer to [3M Information Folder 1.8](#) for details. Clear coating is neither required nor recommended. Use of process colors series other than 880I or 880N is not recommended.

7.3 3M™ ElectroCut™ Film

3M™ ElectroCut™ Film Series 1170 may be used on Sheeting to provide transparent colored background copy for traffic control Signs. Refer to [3M Product Bulletin 1170](#) for fabrication procedures.

7.4 Applying Cut-Out Copy

Diamond Grade™ DG³ Prismatic Sheeting cut-out copy may be applied to sheeting backgrounds to create Sign legends. Refer to [3M Information Folder 1.10](#) for more information.

8 Cutting

Sheeting may be cut into letters and shapes with heights of at least 3 inches and stroke widths of at least ½ inch. Smaller sizes are not recommended. Sealing the cut edges of Sheeting is not required.

8.1 Plotter Cutting

- 1 Flat bed plotters can be used to cut Sheeting and offer the most consistent and reliable performance.
- 2 Friction fed plotters can be used to kiss cut only. This is achieved using 600 grams of down force and a 60° cutting blade. Additional drive wheels may be needed to improve tracking. Alternatively, Sheeting can be cut from the liner side. To do so, the blade force and knife depth must be set to score, but not cut through, the top film. After scoring, break apart individual copy or apply premask to retain spacing.

8.2 Other Cutting Methods

Sheeting may be hand cut or die cut one sheet at a time. Cutting procedures can be found in [3M Information Folder 1.10](#).

9 Installation

Nylon washers are required when twist style fasteners are used to mount Signs

10 Shelf-Life, Processing, Storage, Packaging, and Cleaning

Please refer to [3M Information Folder 1.11](#).

11 Durability

Please refer to [3M Information Folder 1.7](#). Periodic Sign inspection and regular Sign replacement are strongly recommended in order to help Sign owners establish their own effective service life expectations, beyond the warranty period.

12 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets (SDS), Article Information Sheets, and products labels of any materials for important health, safety, and environmental information prior to handling or use. To obtain SDSs and Article Information Sheets for 3M products, go to 3M.com/SDS, contact 3M by mail, or for urgent requests call 1-800-364-3577.

13 Warranty Information

13.1 3M Standard Product Warranty

The Sheeting is warranted (“3M Standard Warranty”) to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this product bulletin. If the Sheeting is proven not to have met the 3M Standard Warranty on their shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the Sheeting.

13.2 3M™ MCS™ Warranty and 3M™ MCS™ Warranty for Traffic

For warranty on digitally printed Sheeting, please refer to the [3M Sign Warranty Bulletin](#).

13.3 Disclaimer

THE 3M WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM, OR USAGE OF TRADE.

13.4 Limitation of Liability

Except for the limited remedy stated above, and except where prohibited by law, 3M will not be liable for any loss or damage arising from the Signs or any 3M product, whether direct, indirect, special, incidental, or consequential damages (including but not limited to lost profits, business, or revenue in any way), regardless of the legal theory asserted including warranty, contract, negligence, or strict liability.

14 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's Website at <http://www.mmm.com/roadsafety>.

15 Literature References

3M IF 1.4	Instructions for Interstate Squeeze Roll Applicator
3M IF 1.5	Hand Application Instructions
3M IF 1.6	Hand Squeeze Roll Applicator
3M IF 1.7	Sign Base Surface Preparation
3M IF 1.8	Process Colors Series 880 and 900 Instructions for Use
3M IF 1.10	Cutting, Premasking, and Prespacing
3M IF 1.11	Sign Maintenance Management
3M IF 1.17	User Guide 3M™ Reflective Sheeting and HP Latex 360/365 Printers
3M PB 1160i	3M™ Premium Protective Overlay Film 1160i
3M PB 1170	3M™ ElectroCut™ Film Series 1170
3M PB 880I	3M™ Process Color Series 880I
3M PB 880N	3M™ Process Color Series 880N
3M PB Slipsheeting	3M™ Slipsheeting
3M Sign Warranty Bulletin	
3M™ MCS™ Warranty for Traffic Matrix for ElectroCut™ Film Series 1170	
3M™ MCS™ Warranty for Traffic Matrix for Screen Printed Signs	
3M™ MCS™ Warranty for Traffic Matrix for Unimaged 3M™ Retroreflective Sheeting	
3M™ MCS™ Warranty Matrix for HP Latex 360/365 Printers	
3M™ MCS™ Warranty Matrix for HP Latex HP 360-365	
3M™ MCS™ Warranty Matrix for HP Latex 1500 Printer	
3M™ MCS™ Warranty Matrix for Traffic for HP Latex 1500 Printer	
HP 700, HP 800 Matrix	
HP 700, HP 800 Matrix for Traffic	
HP Large Format Printing Knowledge Center	

ASTM Test Methods are available from ASTM International, West Conshohocken, PA.

For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-3M HELPS (1-800-364-3577)

Internet:

<http://www.3M.com/roadsafety>

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