

Commercial Branding and Transportation Division

3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS

Product Bulletin Series 4000UDS February 2025

1 Description

3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS (“**Sheeting**”) is a full cube retroreflective prismatic digital sheeting that has been designed to optimize digital imaging of traffic control signs that are exposed vertically in service, when imaged with ultraviolet ink jet (UVIJ) inks, or latex ink jet inks and overlaminated with clear 3M™ Protective Overlay Film 1170C or 3M™ Premium Protective Overlay Film 1160i.

Sheeting is not suitable for a sign application without clear 3M™ Protective Overlay Film 1170C or 3M™ Premium Protective Overlay Film 1160i as overlaminated. Sheeting Series 4000UDS comprises solventless adhesive¹, coated without the use of organic solvents.



3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS is certified for the manufacturing of signfaces for traffic signs with a European Technical Assessment (ETA). All provisions concerning the assessment and verification of constancy of performance described in the ETA-24/0246 were applied and the product fulfills all the prescribed requirements (see the Declaration of Performance at the end of this document for more details). The producer of digitally printed sign face constructions may use cascaded Initial Type Testing for the traffic colors and combinations that are covered in ETA 24/0246.

The Sheeting is available in the following colors.

Color	Product Code
White	4090UDS
Yellow	4091UDS
Fluorescent Yellow	4081UDS
Fluorescent Yellow-Green	4083UDS
Fluorescent Orange	4084UDS

Table 1. Product codes by color

¹ Due to the use of ancillary organic materials in the manufacturing of the adhesive, traces of organic solvent can be found in the product

2 Photometric and Colorimetric Properties

The initial minimum coefficient of retro-reflection of 3M™ Diamond Grade™ DG3 Reflective Digital Sheeting Series 4000UDS, when laminated with clear 3M™ Protective Overlay Film 1170C or 3M™ Premium Protective Overlay Film 1160i, measured in accordance with the procedure specified in CIE Publication No. 54.2 using CIE standard illuminant A, conforms to the values in Table A and B. The angular definitions apply to the CIE Goniometer system (co-planar geometry). The sheeting shall be mounted in 0° orientation on the goniometer (as shown below).

Table A conforms to the requirements of BS EN 12899-1:2007 Class R3C-UK, intended for long and medium distance performance.

Geometry of measurements $\beta_2 = 0, \varepsilon = 0$	$\alpha = 0.2^\circ$		$\alpha = 0.33^\circ$		$\alpha = 0.5^\circ$		$\alpha = 1.0^\circ$	
	$\beta_1 =$		$\beta_1 =$		$\beta_1 =$		$\beta_1 =$	
	5°	30°	5°	30°	5°	30°	5°	30°
White	580	220	300	140	420	150	120	45
Yellow	435	165	250	128	315	110	90	34
Fluorescent Yellow	350	130	180	90	250	90	72	27
Fluorescent Yellow-Green	460	180	240	110	340	120	96	36
Fluorescent Orange	175	66	90	42	125	45	36	14

Table A: Minimum Coefficient of Retroreflection [$\text{cd} / (\text{lx} \cdot \text{m}^2)$] for Long and Medium Distance Performance Class R3C-UK

Table B characterizes the sheeting for the medium and short distance range. Table B conforms to the requirements in DIN 67520:2024 Class RA 3B.

Geometry of measurements $\beta_2 = 0, \varepsilon = 0$	$\alpha = 0.33^\circ$				$\alpha = 1.0^\circ$				$\alpha = 1.5^\circ$			
	$\beta_1 =$				$\beta_1 =$				$\beta_1 =$			
	5°	20°	30°	40°	5°	20°	30°	40°	5°	20°	30°	40°
White	300	240	165	30	35	30	20	3.5	15	13	9	1.5
Yellow	195	155	110	20	23	20	13	2	10	8	6	1
Fluorescent Yellow	195	155	110	20	23	20	13	2	10	8	6	1
Fluorescent Yellow-Green	240	190	130	24	28	24	16	2.5	12	10	7	1
Fluorescent Orange	90	70	30	9	10	9	6	1	4.5	4	2.5	#

Table B: Minimum Coefficient of Retroreflection [$\text{cd} / (\text{lx} \cdot \text{m}^2)$] for Medium and Short Distance Performance Class RA 3B

The initial chromaticity coordinates and luminance factors conform to the colorbox of Table C, when illuminated with CIE standard illuminant D65 and measured with 45/0 geometry. The colorbox for white and yellow is similar to Class CR2 of EN 12899-1:2007 for Class RA 2 materials. The luminance factor for white and yellow exceeds the requirements to demonstrate superior daytime performance.

Color	1		2		3		4		Luminance factor
	x	y	x	y	x	y	x	y	β
White	0.305	0.315	0.335	0.345	0.325	0.355	0.295	0.325	≥ 0.40
Yellow	0.494	0.505	0.470	0.480	0.513	0.437	0.545	0.454	≥ 0.24
Fluorescent Yellow	0.521	0.424	0.557	0.442	0.479	0.520	0.454	0.491	≥ 0.38
Fluorescent Yellow-Green	0.387	0.610	0.460	0.540	0.438	0.508	0.376	0.568	≥ 0.70
Fluorescent Orange	0.595	0.351	0.645	0.355	0.570	0.429	0.531	0.414	≥ 0.25

Table C: Chromaticity and luminance factors

For printed transparent color areas on white and yellow sheetings, when processed according to 3M recommendations, the coefficients of retroreflection shall not be less than 70% of the requirements for the corresponding color. For unprinted sheeting, covered with clear 3M™ Protective Overlay Film 1170C or 3M™ Premium Protective Overlay Film 1160i, when processed according to 3M recommendations, the coefficients of retroreflection shall not be less than 100% of the value in Table A and B. The chromaticity coordinates and luminance factors shall conform to Table C. This complies with respective requirements in EN 12899-1 and ETA-24/0246.

3 System of Matched Components

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

4 Orientation

Diamond Grade™ DG3 is designed to be an effective wide-angle reflective sheeting regardless of the orientation on the substrate or ultimate application orientation after installation. However, because the efficiency of light return from cube corner reflectors is not equal at all rotation angles, the sheeting should be positioned in 0° or 90° application orientation on the completed sign when wide entrance angle performance is important for a given sign type or situation.

Only if high entrance angle performance beyond 40° is a requirement for your signs, the completed sign should have the sheeting positioned at the 0° application orientation.

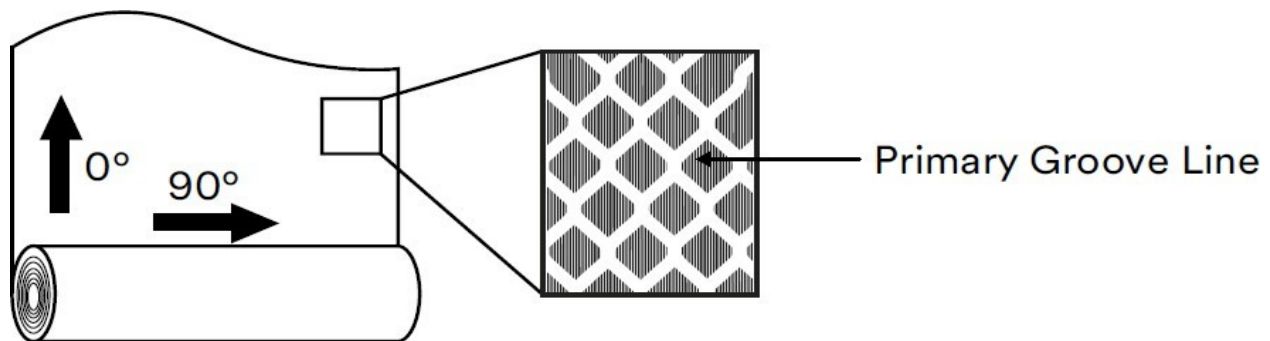
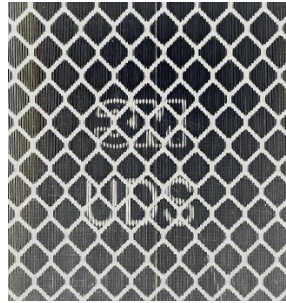


Figure 1. Primary groove lines used to define Sheeting orientation.

When the “primary groove line” is vertical in the completed sign, sheeting is said to be at a 0° application orientation. When the “primary groove line” is horizontal in the completed sign, the sheeting is said to be at a 90° application orientation.

3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS has integrated ‘UDS’ marks to allow differentiation from regular 3M™ Diamond Grade DG³ Series 4000 Sheeting.



4.1 Fabrication Lines

The manufacturing of prismatic sheeting results in fabrication lines in the product. In Diamond Grade™ DG³ sheeting these lines are slightly thicker than the seal pattern legs. Fabrication lines are noticeable in shop lights but are not observable on the road either in daylight or at night (Figure 2).

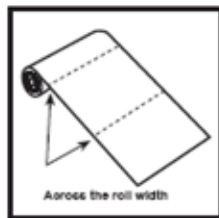


Figure 2 – Fabrication Lines

5 Substrates

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

For traffic sign use, product application is limited to properly prepared aluminum. The substrate should be conditioned prior to application to provide a minimum surface temperature of 15°C (60°F).

Extrusions and flat panel signs are to be carefully trimmed, so that sheeting from adjacent panels does not touch on assembled signs. Users are urged to carefully evaluate all other substrates for adhesion and sign durability. 3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS is designed primarily for applications to flat substrates. Rivets or bolts should also support any use that requires a radius of curvature of less than 130 mm.

Sign failures caused by the substrate or improper surface preparation 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 18°C (65°F) 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 Splices

3M™ Diamond Grade™ DG³ sheeting should be butt spliced when more than one piece of sheeting is used on one piece of substrate. The sheeting pieces should not touch each other. A splice gap of up to 1.5 mm is acceptable. This is to prevent buckling as the sheeting expands in extreme temperature and humidity exposure.

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 14 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 all 3M qualified digital printers and ink systems. Refer to [3M Information Folder 1.19](#), [3M Information Folder 1.20](#), [3M Information Folder 1.17](#) and [HP Large Format Printing Knowledge Center](#) for details. Use of 3M™ Protective Overlay Film 1170C or 3M™ Premium Protective Overlay Film 1160i is required. Temporary traffic signs using 4084UDS (Fluorescent Orange) do not require the use of a protective clear overlay film.

8 Cutting

Sheeting may be cut. Sealing the cut edges of Sheeting is not required.

8.1 Plotter Cutting

Flatbed plotters can be used to cut Sheeting and offer the most consistent and reliable performance.

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

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

10 Durability

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

11 Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Safety Data Sheets and/or product label of chemicals prior to handling or use.

12 General Performance Considerations

The performance and durability of 3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS will depend upon a number of factors including (but not limited to):

- Application procedures
- Geographic area
- Exposure and atmospheric conditions (e.g. snow, frost)
- Correct combination of sheeting, piezo inkjet ink, and overlay film
- Ink drying/UV curing methods
- Cleaning and maintenance methods

13 Warranty Information

Subject to terms and conditions 3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS sold by 3M to be used for traffic control signs and devices in Europe may be warranted for a period up to 12 years from date of application (concrete definition of the period is subject to the terms of sale) to be free of defects in material and workmanship, provided that:

If 3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS is processed and applied to a vertical 10° surface in accordance with all 3M application and fabrication procedures provided in 3M's product and information folders, technical memos (which will be furnished to the agency upon request), including the exclusive use of 3M matched component systems, process colors, overlay films and recommended application equipment.

This warranty is personal to the original purchaser of 3M™ Diamond Grade™ DG³ Reflective Digital Sheeting Series 4000UDS and may not be transferred or assigned without 3M approval.

13.1 Important Notice to Purchaser

So far as permitted by law all statements, technical information and recommendations herein are based on tests 3M believes to be reliable, but the accuracy or completeness thereof is not guaranteed. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. All questions of warranty and liability relating to this product are governed by the terms of the sale subject where applicable to the prevailing law.

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13.3 Limitation of Liability

So far as permitted by law 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.

13.4 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>.

14 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 1.10	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 IF 1.19	Digital Imaging with Durst 163TS Printers on 3M™ Reflective Sheeting
3M IF 1.20	Digital Imaging with EFI H1625 RS Printer on 3M™ Reflective Sheeting
3M PB 1160i	3M™ Premium Protective Overlay Film 1160i
3M PB 1170	3M™ ElectroCut™ Film Series 1170

[3M PB Slipsheeting](#) 3M™ Slipsheeting
[3M Sign Warranty Bulletin](#)
[3M™ MCS™ Warranty for Traffic Matrix for EFI H1625-RS](#)
[3M™ MCS™ Warranty Matrix for EFI H1625-RS](#)
[3M™ MCS™ Warranty Matrix for HP Latex 360/365 Printers](#)
[3M™ MCS™ Warranty for Traffic Matrix HP 360-365](#)
[3M™ MCS™ Warranty Matrix for Durst 163TS and 163TS-HS Printers](#)
[3M™ MCS™ Warranty for Traffic Matrix for Durst 163TS & 163TS-H](#)
[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](#)

Internet: <http://www.mmm.com/roadsafety>

3M assumes no responsibility for any injury, loss, or damage arising out of the use of a product that is not of our manufacture. Where reference is made in literature to a commercially available product, made by another manufacturer, it shall be the user's responsibility to ascertain the precautionary measures for its use outlined by the manufacturer.

Important Notice

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For Further Assistance

For help on specific questions relating to 3M™ reflective products, please contact your local 3M Application Engineer or contact:

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