

Transportation Safety Division

3M™ Diamond Grade™ Flexible Prismatic Markings Series 973

Product Bulletin Series 973
February 2022

Replaces Product Bulletin 973 Dated November 2010

1 Description

3M™ Diamond Grade™ Flexible Prismatic Markings Series 973 have been designed to enhance the visibilities of a wide variety of application surfaces. These highly retroreflective markings consist of prismatic lenses formed in a transparent, synthetic resin that is sealed and backed with an aggressive pressure sensitive adhesive and paper liner.

Series 973 markings are available in standard 50-yard rolls of 1, 2, 4, and 6 inch widths in the colors listed in Table 1.

Table 1. Product codes by color.

| Color | Product Code |
|--------|--------------|
| White | 973-10 |
| Yellow | 973-71 |
| Red | 973-72 |
| Orange | 973-74 |
| Blue | 973-75 |
| Green | 973-77 |

2 Coefficient of Retroreflection, R_A

The values presented in Table 2 indicate the minimum average initial coefficients of retroreflection, R_A , expressed in candelas per lux per square meter ($\text{cd}/\text{lux}/\text{m}^2$), for each available Series 973 marking color. The values reflect measurements taken in accordance with ASTM E-810 and, as such, represent averages of values taken at 0° and 90° orientations. Markings should be applied and conditioned at room temperature for 24 hours prior to measurement.

Table 2. Minimum average coefficient of retroreflection, R_A , values for new markings ($\text{cd}/\text{lux}/\text{m}^2$).

| Observation Angle ^a | Entrance Angle ^b | Minimum R_A | | | | | |
|--------------------------------|-----------------------------|----------------|-----------------|--------------|-----------------|---------------|----------------|
| | | White (973-10) | Yellow (973-71) | Red (973-72) | Orange (973-74) | Blue (973-75) | Green (973-77) |
| 0.2° | -4° | 360 | 270 | 65 | 145 | 30 | 50 |
| | 30° | 170 | 135 | 30 | 68 | 14 | 25 |
| 0.5° | -4° | 150 | 110 | 27 | 60 | 13 | 21 |
| | 30° | 72 | 54 | 13 | 28 | 6 | 10 |

a. Observation Angle - the angle between the illumination axis and the observation axis.

b. Entrance Angle - the angle between the illumination axis and the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

2.1 Entrance Angularity Performance in Regard to Orientation

Series 973 markings have been designed to be effective wide angle retroreflective markings regardless of orientation on the substrate. However, because the efficiency of light return from cube corner reflectors is not equal at all application angles (because efficiency decreases as entrance angle increases) it is possible to get the widest entrance angle light return when markings are applied at a specific orientation. When high entrance angle performance is required, apply markings at an application angle of 0° (downweb direction perpendicular to the ground, i.e., vertical). When the “primary groove line” (or, flat side of the diamond shape) is vertical, markings are considered to be at a 0° application angle. When the “primary groove line” (or, flat side of the diamond shape) is horizontal, markings are said to be at a 90° application angle. See Figure 1 for details.

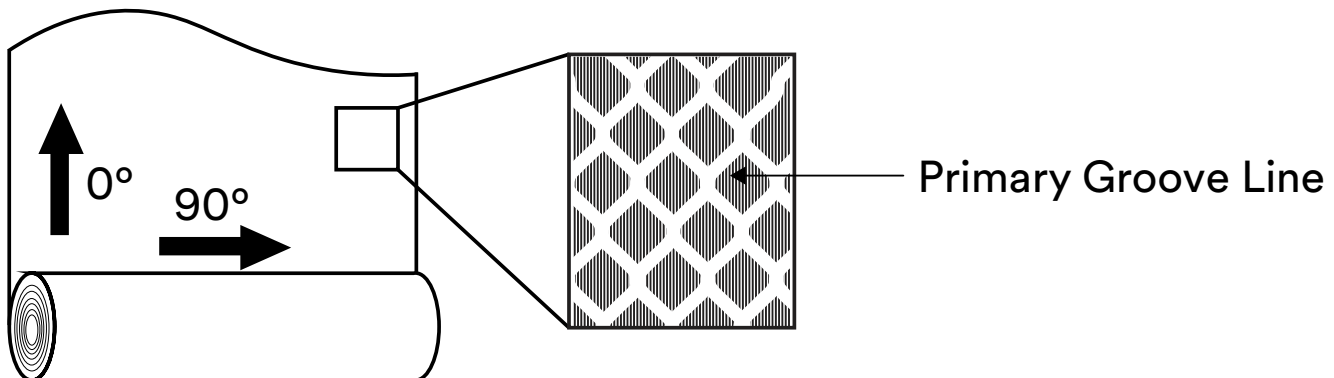


Figure 1. Primary groove lines used to define Sheeting orientation.

Unless the location and/or position of a marking requires extra wide entrance angularity performance, markings can be fabricated and installed using the application angle that most efficiently utilizes the marking’s surface area.

3 Application Procedure

Apply markings to clean surfaces using the following procedures. See [3M Information Folder 4.9](#) for details. Only apply when both marking and substrate temperatures are within the range of 50–100 °F (10–38 °C).

- 1 To avoid wrinkling or lifting, apply markings no closer than 1/8 inch from any moving parts (e.g. hinges), hardware (e.g. screws or bolts), substrate edges, and weld joints. Markings must be cut 1/8 inch from exterior posts and large bolts or rivets.
- 2 Peel marking from liner, position and align marking on application surface, and tack down lightly to hold in position. Care should be taken not to stretch the marking.
- 3 Using a PA-1 applicator, press the marking to the surface using firm, vertical, overlapping strokes. Be sure all edges are adhered by resqueegeeing the edges.

4 Maintenance

4.1 Cleaning

Routine cleaning is recommended for best performance. The following cleaning methods are recommended:

- o Clean with sponge, cloth, or soft brush using water and detergent
- o Standard high-pressure hand spray.
- o When using metal brighteners, follow manufacturer's recommendations for dilution. Thoroughly rinse brightener from markings after soaking.

4.2 Storage

Series 973 markings should be stored in a cool, dry area, out of direct sunlight, at a temperature of 65–75 °F (18–24 °C) and a relative humidity of 30–50%. Rolls should be stored horizontally in their shipping cartons or original packaging.

4.3 Shelf Life

Apply Series 973 markings within one year of date of receipt.

5 Durability

Series 973 markings will provide maximum durability when:

- All 3M recommended procedures are followed and
- Markings are applied to vertical surfaces.

Series 973 marking durability depends on use. Failure to follow 3M-required techniques may reduce durability.

Below are some conditions and processing examples that may lead to reduced durability:

- Failure to cut markings around rivets, seams, and body panels
- Improper use of high pressure cleaning
- Contact with non-recommended chemicals or solvents
- Improper application or surface preparation

6 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheet (SDS), Article Information Sheet, and/or product labels of chemicals prior to handling or use. Consult local regulations and authorities for possible restrictions. Visit us at www.3M.com/us and select SDS search to obtain current Safety Data Sheets.

7 Warranty Information

7.1 3M Standard Warranty

3M Diamond Grade Conspicuity Marking Series 973 (“**Product**”) 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 Product is proven not to have met the 3M Standard Warranty on its shipment date, then a buyer’s exclusive remedy, and 3M’s sole obligation, at 3M’s option, will be a refund or replacement of the Product.

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8 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.3M.com/roadsafety>.

9 Literature References

[3M IF 4.9](#) 3M™ Diamond Grade™ and Flexible Prismatic Conspicuity Markings Application Instructions for Trucks, Trailers, and Specialty Vehicles

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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