



Diamond Grade™ Conspicuity Sheeting 983-23 Fluorescent Yellow Green

Product Bulletin 983-23

March 2008

Description

3M™ Diamond Grade™ Conspicuity Sheeting 983-23 Fluorescent Yellow Green is designed to mark the front, side and rear perimeter of vehicles.

- Durable, microprismatic, fluorescent, retroreflective markings.
- Combined fluorescence and retroreflection provides 24-hour enhanced visibility and detection.
- Fluorescence enhances visibility for improved safety.
- Available in rolls of 2-inch, 4-inch, 6-inch widths x 50 yard rolls for application on rigid vehicles.
- Excellent angularity up to and beyond 45°.
- Easy to apply.
- Up to 7-year exterior durability.
- Markings resist fuel vapors or spills.

Typical Physical Characteristics

| Property | Description |
|---|--|
| Adhesive color and type | Clear, pressure sensitive |
| Liner | Translucent poly |
| Application surfaces | Metal or painted metal flat without rivets |
| Dimensional stability | Less than 1/8 inch (3.2 mm) change in any direction on a 9 x 9 inch sample |
| Gloss | 60° gloss meter – 80 or greater |
| Impact resistance | No cracking, delamination or peeling beyond impact area according to ASTM D523 |
| Heat resistance | Maintains 70% of original coefficient of retroreflection after 24 hr. exposure to 170°F (77°C) air |
| Application temperature range for air and substrate | 50°F to 100°F (10°C to 38°C) |
| Thickness | 0.014 – 0.018 inch (.36 to .46 mm) |
| Performance range | -30°F to 200°F (-34°C to +94°C) |

Coefficient of Retroreflection

The typical coefficient of retroreflection values of these sheetings when new are given in Table A in terms of candelas per lux per square meter. Measurements are made in accordance with ASTM E-810 “Standard Test Method for Coefficient of Retroreflective Sheeting” in terms of candlepower per foot-candle per square foot (cd/lux/m²).

Table A

Typical Coefficient of Retroreflection (R_A) for New Sheeting (cd/lux/m²)
¹Observation Angle

| | | | |
|-----------------------------|-----|------|------|
| 983-23 | | 0.2° | 0.5° |
| ² Entrance Angle | -4° | 800 | 400 |
| | 30° | 525 | 215 |
| | 45° | 250 | 80 |

¹Observation Angle – The angle formed by the light beam striking the reflective surface and the light beam returning to the observer (from 800 feet, a motorist normally views a marking at approximately an 0.2° observation angle).

²Entrance Angle – The angle formed by a light beam striking a surface at a point and a line perpendicular to the surface at the same point.

Photometrics

Daytime Color (x,y,Y)

Daytime chromaticity coordinates of fluorescent retroreflective markings conform to the following limits.

Table B

CIE Daytime Chromaticity Coordinate Limits for New Markings

| Color Corner Points | 1 | 2 | 3 | 4 |
|---------------------|--------|--------|--------|--------|
| | x / y | x / y | x / y | x / y |
| Fluorescent | .387 / | .369 / | .428 / | .460 / |
| Yellow/Green | .610 | .546 | .496 | .540 |

Fluorescence

Fluorescent materials absorb short wavelength, invisible, incident radiation (solar energy) and re-emit the radiation as longer wavelength, visible light. This re-emitted energy continues as long as incident radiation is present. These materials are especially effective during dawn, dusk, and overcast days. Fluorescence adds to daytime luminance (apparent brightness) of markings and enhances the visibility of rail cars and other vehicles.

Color Test – Fluorescent Sheetings

Conformance to standard chromaticity (x, y) and luminance factor (Y) requirements shall be determined by instrumental method in accordance with ASTM E 991 on sheeting applied to smooth aluminum test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2° standard observer.³

Daytime fluorescence luminance factor values for 983-23 fluorescent yellow green are given in Table C.

Table C

Daytime Luminance Factor Values for 3M™ Diamond Grade™ Fluorescent Yellow Green Conspicuity Markings³

| Color | Total Luminance Factor Y |
|--------------------|--------------------------|
| Fluorescent Yellow | 60% min. |

³The instrumentally determined color values of retroreflective sheeting can vary significantly depending on the make and model of colorimetric spectrophotometer as well as the color and retroreflective optics of the sheeting (David M. Burns and Timothy J. Donahue, Measurement Issues in the Color Specifications of Fluorescent Retroreflective Materials for High Visibility Traffic Signing and Personal Safety Applications, Proceedings of SPIE: Fourth Oxford Conference on Spectroscopy, 4826, pp. 39-49, 2003). For the purpose of this document, the HunterLab ColorFlex 45/0 spectrophotometer shall be the referee instrument.

Storage and Shelf Life

- Store in a cool (65° – 75°F), dry (30 – 50% RH), clean area and out of direct sunlight.
- Partially used rolls should be returned to the shipping carton.
- 1 year shelf life.

Maintenance and Cleaning

- Hand wash with sponge, cloth or soft brush using warm water and detergent.
- Automatic truck/car wash or standard high-pressure hand spray:

Maximum pressure – 1200 PSI/80 bar.

Maximum water/wash solution temperature – 140°F/60°C.

Minimum of 12 inches/30cm distance of cleaning jet(s) from markings.

Cleaning wand or jets to be at no greater angle than 45° from perpendicular to marking surface.

Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use. Also refer to the MSDS for information about the volatile organic compound (VOC) content of chemical products. Consult local regulations and authorities for possible restrictions. Electronically, visit us at www.3M.com/us and select MSDS search.

General Performance Considerations

Series 983 markings will provide maximum durability when:

- 3M recommended procedures are followed.
- Marking is applied to vertical surfaces.

Actual durability will be based on actual customer use, field testing, exterior exposed testing and artificial weathering testing.

Durability can be reduced if recommended techniques are not followed:

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

Warranty

3M warrants that 3M™ Diamond Grade™ Conspicuity Marking 983-23 sold by 3M to be used for markings in the United States and Canada will remain effective for its intended use for seven years.

If 3M reflective marking are applied in accordance with all 3M application and fabrication procedures provided in 3M's product bulletins, information folders, technical memos (that will be furnished to the agency upon request), including the exclusive use of 3M recommended application equipment; and if the marking deteriorates due to natural causes; such as fading, cracking, peeling, lifting, or discoloration; 3M's sole responsibility and purchaser's and user's exclusive remedy shall be that 3M will provide replacement of the 3M material.

Conditions

Such failure must be solely the result of design or manufacturing defects in the 3M reflective markings and not of outside causes such as improper handling, maintenance or installation; use of application procedures not recommended by 3M; failure of substrate; exposure to chemicals, abrasion and other mechanical damage from fasteners used to mount the emblem or marking; collisions, vandalism or malicious mischief.

3M reserves the right to determine the method of replacement.

Replacement markings will carry the unexpired warranty of the marking it replaces.

Claims made under this warranty will be honored only if 3M is notified of a failure within a reasonable time, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

Limitation and Liability

3M's liability under this warranty is limited to replacement as stated herein, and 3M assumes no liability for any incidental or consequential damages, such as lost profits, business or revenues in any way related to the product regardless of the legal theory on which the claim is based. THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM OR USAGE OF TRADE.

FOR INFORMATION OR ASSISTANCE

**CALL:
1-800-553-1380**

**IN CANADA CALL:
1-800-265-1840**

**Fax-on-Demand in the U.S. and Canada:
1-800-887-3238**

**Internet:
www.3M.com/tss**

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

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, special or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.

3M and Diamond Grade are trademarks of 3M. Used under license in Canada.



Traffic Safety Systems Division

3M Center, Building 0225-05-S-08
St. Paul, MN 55144-1000
1-800-553-1380
www.3M.com/tss

3M Canada Company

P.O. Box 5757
London, Ontario N6A 4T1
1-800-3MHELPS

3M México, S.A. de C.V.

Av. Santa Fe No. 55
Col. Santa Fe, Del. Alvaro Obregón
México, D.F. 01210

Please recycle.
© 3M 2008. All rights reserved.
Electronic Only