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## 1 Description

3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000, 3M Diamond Grade VIP Reflective Sheeting Series 3990, 3M Diamond Grade Fluorescent Work Zone Sheeting Series 3924S, 3M High Intensity Prismatic Reflective Sheeting Series 3930, and 3M Engineer Grade Prismatic Reflective Sheeting Series 3430 are compatible with HP Latex 360/365 printers when used in combination with HP 831 Latex inks.

Series 4000, Series 3990, and Series 3930 sheetings are all backed by the **3M™ MCS™ Warranty** and 3M MCS Warranty for Traffic when the printing guidelines in this document are followed and 3M ElectroCut™ Film 1170C Clear is applied over the finished graphics. See the Section 12.1 of this document and the separately available warranty matrices for more information on the MCS Warranties.

Signs printed for temporary traffic use, such as those printed on 3M Diamond Grade Fluorescent Work Zone Sheeting Series 3924s, are not covered as part of the 3M MCS warranty. Such signs do not require overlaminates.

Colors that meet ASTM D4956 requirements for daytime color, nighttime color, luminance factor, and retroreflectivity are referred to herein as traffic colors (“Traffic Colors”).

Non-ASTM defined colors, also known as process colors (“Process Colors”) or process color graphics, may be printed on any of the above-mentioned sheetings and, except when used on un laminated temporary traffic signs, are backed by the 3M MCS Warranty.

## 2 Specifications

Sign constructions discussed in this document conform to the performance requirements described in Table 1.

Table 1. Summary of Color and Retroreflectivity Specifications of the Sheetings

<table>
<thead>
<tr>
<th>Sheetings/Overlay</th>
<th>Printed Colors</th>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M 3930 (white) / 1170</td>
<td>Traffic BLUE, Traffic GREEN, Traffic BROWN, Traffic RED, Traffic PURPLE</td>
<td>Daytime color</td>
<td>ASTM D4956-16 Table 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nighttime Color</td>
<td>ASTM D4956-16 Table 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luminance Factor</td>
<td>ASTM D4956-16 Table 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coefficients of Retroreflection (R_a)</td>
<td>70% of ASTM D4956-16 Table 5 (Type IV)</td>
</tr>
<tr>
<td>3M 3990 (white) / 1170</td>
<td>Traffic BLUE, Traffic GREEN, Traffic RED, Traffic PURPLE</td>
<td>Daytime color</td>
<td>ASTM D4956-16 Table 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nighttime Color</td>
<td>ASTM D4956-16 Table 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luminance Factor</td>
<td>ASTM D4956-16 Table 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coefficients of Retroreflection (R_a)</td>
<td>70% of ASTM D4956-16 Table 9 (Type IX)</td>
</tr>
<tr>
<td>3M 4000 (white) / 1170</td>
<td>Traffic BLUE, Traffic GREEN, Traffic BROWN, Traffic RED, Traffic PURPLE</td>
<td>Daytime color</td>
<td>ASTM D4956-16 Table 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nighttime Color</td>
<td>ASTM D4956-16 Table 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luminance Factor</td>
<td>ASTM D4956-16 Table 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coefficients of Retroreflection (R_a)</td>
<td>70% of ASTM D4956-16 Table 10 (Type XI)</td>
</tr>
<tr>
<td>3M Series 3930 (“HIP”)(^a)</td>
<td>Traffic BLACK</td>
<td>Opaque</td>
<td></td>
</tr>
<tr>
<td>3M Series 3990 (“VIP”) (^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 4000 (“DG³”) (^c)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 3930 (^a)</td>
<td>Process Colors</td>
<td>No ASTM-defined applications</td>
<td></td>
</tr>
<tr>
<td>3M Series 3990 (^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 4000 (^c)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 3924S</td>
<td>BLACK only</td>
<td>Opaque</td>
<td></td>
</tr>
<tr>
<td>3M Series 3430 (^d)</td>
<td></td>
<td></td>
<td>No warranties of color or durability provided on Engineer Grade</td>
</tr>
</tbody>
</table>

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\(^a\) 3M Series 3930 includes: 3930 (white with 1170), 3931 (yellow), 3932 (red), 3935 (blue), 3937 (green), 3939 (brown)

\(^b\) 3M Series 3990 includes: 3990 (white), 3991 (yellow), 3992 (red), 3995 (blue), 3997 (green), 3981 (fluorescent yellow), 3983 (fluorescent yellow green)

\(^c\) 3M Series 4000 includes: 4090 (white), 4091 (yellow), 4092 (red), 4095 (blue), 4097 (green), 4099 (brown), 4081 (fluorescent yellow), 4083 (fluorescent yellow green), 4084 (fluorescent orange)

\(^d\) 3M Series 3430 includes: 3430 (white), 3431 (yellow), 3432 (red), 3435 (blue), 3437 (green), 3439 (brown)
3 Printing Guidelines

3.1 Selecting, Storing, Preparing, and Using 3M Retroreflective Sheeting

Do not use damaged rolls of sheeting; doing so can result in head strikes and printer damage. Condition sheeting, ink, and overlaminate by keeping them the same environment as the printer for at least 24 hours before printing. Operate printer under ambient conditions conforming to the parameters presented in Table 2.

Table 2. Use Printer in a Climate-Controlled Room under the Following Conditions

<table>
<thead>
<tr>
<th>Relative humidity range for best print quality</th>
<th>40–60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range for best print quality</td>
<td>68–77 °F</td>
</tr>
</tbody>
</table>

3.2 About Traffic Colors

Differences in color appearance, which are affected by the sheeting, e-cut film, and screen and digital printing processes used, are normal and expected. Although prints made using different combinations of these materials and processes may appear visually different, when prepared per 3M requirements, each satisfies the traffic color requirements indicated in Table 1 and qualifies for full 3M™ MCS™ Warranty coverage.

Each material and process has a specific range of colors that it can produce. The available color range depends on both the material characteristics and the color pigments used. Different inks and films also have different translucencies, which impact retroreflectivity differently. Each traffic color has a daytime color, nighttime color, and retro-reflectivity specification and a visual color match does not guarantee that a sign construction will meet all specification requirements.

Visual differences are most noticeable when signs are displayed on the same sign post, or otherwise in close proximity, and under similar lighting conditions. Process- and materials-dependent color variations are, and have always been, well known and unavoidable sign construction challenges. If such differences are objectionable, signs to be mounted in close proximity and under similar lighting conditions must be made from the same materials, using the same processes.

3.3 3M MCS Warranty for Traffic and Printer Conditions

As stated in Section 3.2, when the guidelines presented in this document are followed, durable signs are produced and the user is entitled to the benefits of the 3M MCS Warranty for Traffic. However, altering any of several operating conditions voids the 3M MCS Warranty for Traffic. These warranty-voiding actions are discussed presently, before details of how to operate a HP Latex 360/365 printer under warranty conditions are discussed.

Note: Review Tables 3 and 4 before making (or allowing any third party to make) any changes to printer conditions.

3M has designed Traffic Colors to be printed on 3M sheeting using a HP 360/365 printer and 3M Flexi for use in the production of traffic signs that meet the color, retroreflectivity, and weathering durability regulations of various regions around the world. The HP 360/365 printer is a complex machine with many variables that are often adjusted by end-users when producing commercial graphics and other non-regulated images. It is imperative that many of the changes frequently used in the production of non-regulated commercial graphics NOT be employed when printing regulated traffic signs. Modify print conditions only by following the recommendations presented in Tables 3 and 4 below. Unless written guidance has been provided by a 3M representative, signs produced using settings not conforming to these tables will not carry the 3M MCS Warranty for Traffic.
4 Initial Setup

The following steps will ensure accurate printing of Traffic Colors using a HP Latex 360/365 printer:

1. Install Flexi Authorized 3M Traffic Edition software
2. Verify that the printer’s firmware is current and update if necessary
3. Install media files from HP Substrate Library
4. Perform color calibration
5. Print and mail color checker file
6. Register printer

4.1 Install Flexi Authorized 3M Traffic Edition Software

SAi Production Manager, Authorized 3M Traffic Edition 12 or higher, comes pre-installed with presets for HP Latex printers. These presets include color formulations that properly match Traffic Signage standards on 3M sheeting.

To install:

a. Locate the activation voucher provided by SAi.

b. Create an account at [www.saicloud.com](http://www.saicloud.com) and activate the license.

c. Follow the link to the SAi software download page.

d. Download and install the software (SAi Production Manager, Authorized 3M Traffic Edition 12 or higher).

e. Upon launching software for first time, input printer model number and IP address, when prompted.

More detailed information available at: [https://youtu.be/izQ5SxtuiR8](https://youtu.be/izQ5SxtuiR8) (note that the activation code is provided by SAi, rather than with the Latex 360/365 printer as shown in the video).
Once the RIP software, Flexi Production Manager, detects the newly installed media presets, it will request to synchronize. Synchronization completes in a few minutes, then the printer and RIP software are ready to print.

### 4.2 Verify Latest Firmware

On the printer’s front panel, navigate to the firmware update page: **Printer > Firmware Update > Check updates.**

![Figure 1. Screen navigation to view latest firmware.](image)

### 4.3 Install Media Files on Printer

#### Table 5. Media File Names by Sheeting Product and Use

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Media File Name</th>
<th>Information Signs (Process Colors)</th>
<th>Temporary Traffic Signs (Traffic BLACK only)</th>
<th>Warning, Regulatory, and Guide Signs (Traffic Colors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M Series 3430</td>
<td>3M 3430Traffic Colors v3</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 3930</td>
<td>3M 3930Traffic Colors v3</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 3990</td>
<td>3M 3990Traffic Colors v3</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 4000</td>
<td>3M 4000Traffic Colors v3</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M Series 3924</td>
<td>3M 3924 Preset for Black only images</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Press the **Substrate Library** button on the main printer menu.

2. Select the **Online search** option and filter the results by Brand (**3M Commercial Graphics**).

![Figure 2. Searching the online library for media files.](image)
Once the media file has been located, click on the download symbol ( ) on the right. Media file download and installation will then occur without further user input. Repeat for each required media file.

### 4.4 Perform Color Calibration

The printer’s color calibration status can be checked as shown in Figure 3 at any time.

The printer’s internal calibration equipment requires non-reflective material. 3M IJ180 self-adhesive vinyl is required for 3M Traffic Color calibration.

a. Load a roll of 3M IJ180 self-adhesive vinyl onto printer

b. On the printer’s front panel, select the reflective sheeting to be calibrated

c. Click: **Settings > Image Quality Maintenance > Color Calibration > Calibrate**

d. Once calibration process has finished, load reflective sheeting print medium.

### 4.5 Print and Mail Color Checker File

**Note:** These next steps are not required for black-only temporary traffic signs.

Open FlexiPRINT and draw a 4”x4” square for each traffic color in a pattern that fits the width media being used. Next, use the **Fill/Stroke Editor** to fill each square with a 3M Traffic Color, as shown below, in Figure 5.

Laminate the print with 1170 overlaminate film, as described in Section 7, and label the back of it with the following:

a. Date printed

b. Printer model #

c. Name of sign shop

d. Email address

Send the color checker print, as a strip or cut into squares, to:

3M Center  
Building 235-3W-52  
Attn: HP Printer Support  
St. Paul, MN 55144

**IMPORTANT:** refer to section 5 before printing color checker to ensure correct settings are used.
4.6 Printer Registration

By taking a few minutes to register your printer, you can validate your 3M product warranty(ies), be privy to developments in digital sign printing technology, enjoy extended support, receive product alerts, and more. Register your traffic printer at [http://ews.3M.com/ews/pub/registration.htm](http://ews.3M.com/ews/pub/registration.htm).

5 Printing

When printing for traffic applications, follow these software and physical procedures to ensure expected output and long-term functionality of your HP printer solution. This section presents specific instructions for printing on 3M reflective sheeting. For other print constructions, follow the instructions available in the HP Latex 300 Printer Series User’s Guide.

Because of the weight of 3M reflective traffic sheeting, it is recommended that the main feed and take up reels be used in the second position from the right, as shown in Figure 6.

![Figure 6. Proper traffic sheeting spindle loading location.](image)

Because of its rigidity, printing on 3M reflective traffic sheeting requires the use of edge holders. A variety of edge holder types are available. Work with your HP reseller to determine what holder best suits your application. If “butterfly” edge holders (which are mounted back-to-back to give greater media coverage) are used, the onboard cutter option may not be, or the user risks severely damaging the printer. The onboard cutter option may be safely used with paper, vinyl, and other non-traffic sheeting media only after butterfly edge holders have been removed entirely.

![Figure 7. Edge holder.](image)

Load 3M sheeting so that the leading edge lies beyond the metal curing platform. Failure to feed the leading edge past the metal curing platform can result in significant buildup of adhesive residue, which in turn can lead to a variety of significant printing issues.
The take up reel should be used for all print jobs. It increases tension, which helps to hold the rigid sheeting against the platens, ensuring consistent print quality and helping to prevent head strikes.

When asked, select the correct media file from the Substrate Library menu. The media files for 3M reflective sheetings are found in the Self-Adhesive Vinyl media folder.

After selecting the media file, press the Substrate button on the front panel and verify that the color calibration line reads “Ok,” indicating it is still current. If it reads “Recommended” or “Obsolete,” follow procedure described in Section 4. Color calibration is required for finished signs to be covered by the 3M™ MCS™ Warranty for Traffic.

With the design file open in FlexiPRINT, use the Fill/Stroke Editor to fill areas of the sign with the appropriate 3M Traffic Colors. This includes replacing any black areas with Traffic BLACK. (Figure 11)
Once the image has the correct coloring, save the file and open it in the Flexi Production Manager RIP software. To do so, select Add Job (Figure 12) and navigate to the file to bring it into the hold queue. Next, double click on the job in the queue to open the Default Job Properties dialogue box (Figure 13).

Next, verify that the value displayed in the drop-down menu at the top of the dialogue box labeled Preset: matches the media loaded into the printer (e.g. ensure the 3930 preset is selected if the printer is loaded with 3M 3930 High Intensity Prismatic sheeting). After making any required changes (print size, number of copies, etc.), click on the third tab from the left to view the color handling properties. Here, verify that Use color correction is selected and all of the other drop-down menus are populated as shown in Figure 13. Also, verify that the box labeled Use color mapping is checked.
Next, click on the **Media Management** tab, the fourth tab from the left, and verify that the settings match the **Printer Profile** settings shown in Figure 14.

![Figure 14. Verifying print job output properties before printing](image)

Once all settings have been confirmed, the job can be sent directly to print or held in the RIP queue like any other print job. Verifying the settings is an important step in making sure that each job prints accurately on the selected 3M sheeting material.
5.1 Alternative Printing Workflow

Some sign libraries are organized such that the “RIP and Print” feature of FlexiSIGN presents a more convenient workflow. The RIP and Print feature is conveniently accessed with a single click, as shown in Figure 15.

![RIP and Print button](image)

**Figure 15.** Location of the RIP and Print button, which can also be accessed using the Ctrl + H keyboard shortcut.

Clicking on the RIP and Print button opens a dialogue box similar to the Job Properties dialogue box found in the Production Manager. Choose **Hold in list** on the first tab of the Rip and Print dialogue box to prevent the accidental selection of an incorrect preset or other setting. The print file must be processed through the Production Manager RIP to properly convert Traffic Colors.

**Note:** A warning box may appear indicating a settings mismatch between RIP and Print and Production Manager. If this warning appears, click **Use PM Settings**.

![Hold in list setting](image)

**Figure 16.** Location of Hold in list setting.

Once the Hold in list processing option has been selected, open Production Manager and verify that all settings are correct, as described in Section 4.5.

Click **Send** to print.
6 Basic Troubleshooting

If issues arise during printing, the following strategies should be used to obtain assistance.

For issues with the inks, printing on non-3M media, or other general printer performance issues, please work with HP and your HP reseller Latex support teams to find satisfactory solutions.

If issues occur when printing on 3M traffic sheeting, load a roll of non-traffic material (paper, generic vinyl, etc.) and print file using the appropriate media file for the non-traffic sheeting material. If the problem persists on the non-traffic material, then work with the HP and HP reseller support teams. HP Latex Support can be reached at 1-800-204-6344.

If the problem appears only when printing on 3M traffic sheeting, please call HP Latex Support at 1-800-204-6344 and start a case. After starting a case with HP, call 3M Support at 1-800-553-1380 (option 4) and provide your HP case number along with details relevant to the printing issue.

7 Application of Overlaminate

Printed images must be dry before being overlaminated with 3M™ ElectroCut™ Film 1170C Clear. See Table 3 footnote for details. Lamination should be performed using a laminator that meets the following criteria:

1. Roll to roll, manual squeeze roll, or flat-bed laminator.
2. Between 48” and 65” wide.
3. Equipped with a pneumatically controlled nip (preferred but not required).
4. Equipped with rubber covered nip rolls capable of a minimum nip pressure of 7 pounds per lineal inch.
5. Equipped with rolls with Shore A durometer of 60 or higher (preferred but not required).
6. Follow the laminator manufacturer's instructions.

Note: If trapped air is observed between ink and overlaminate, consider increasing pressure and/or temperature and/or lowering lamination speed.

8 Durability

The durability of 3M reflective sheeting will depend upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance practices.

Maximum durability can be expected in applications subject to vertical exposure on stationary objects when processed and applied to aluminum prepared according to the 3M recommendations provided in 3M Information Folder 1.7. The user must determine the suitability of any nonmetallic sign backing for its intended use. Applications to unprimed, excessively rough or non-weather-resistant surfaces, or exposure to severe or unusual conditions can shorten the performance lifetimes of such applications. Signs in mountainous areas that are covered by snow for prolonged periods may also have reduced durability. Atmospheric conditions in certain geographic areas may result in reduced durability.

9 Storage of Completed Signs

Completed signs must be protected with SCW 568 slipsheet paper and stored on edge. Placing the glossy side of the slipsheeting against the sign face. Double-faced signs must have the glossy side of slipsheeting against each face of the sign. Unmounted processed faces must be stored flat and interleaved with SCW 568 slipsheeting, glossy side against the sign face. Maximum stack height is five inches.

Avoid banding, crating, or stacking signs. Package for shipment in accordance with commercially accepted standards to prevent movement and chafing. Store sign packages indoors on edges.
10 Environmental, Health, and Safety

CAUTION: When handling any chemical products, read the manufacturers’ container labels and the Safety Data
Sheets (SDS) for important health, safety, and environmental information. To obtain SDS sheets for 3M products, go
to 3M.com/SDS or in case of an urgent need, call 1-800-364-3577. HP SDSs for inks can be found at the HP website.
For 3M product questions or issues, contact the 3M helpline 1-800-553-1380 (option 4).

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

11 Disclaimer

With the exception of 3M branded products, 3M does not represent that any printer or printer accessory
recommended in 3M literature will meet customer requirements, any applicable safety standards, or any federal, state,
or local regulations. Such determination is the responsibility of the printer owner. For a buyer's convenience, 3M may
provide engineering or technical information, recommendations, certifications, and other information or materials
relating to other company's products (“Other Information”), but 3M does not warrant Other Information, including but
not limited to, its accuracy or completeness.

12 Warranty Information

12.1 Limited Warranty

For warranty information, please refer to the 3M Digitally-Imaged Sign Warranty Bulletin, 3M™ MCS™ Warranty

12.2 Limitations of Liability

EXCEPT WHERE PROHIBITED BY LAW, 3M WILL NOT BE LIABLE FOR ANY LOSS OR DAMAGE ARISING FROM
THE 3M PRODUCT, WHETHER DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL, REGARDLESS
OF THE LEGAL THEORY ASSERTED, INCLUDING WARRANTY, CONTRACT, NEGLIGENCE, OR STRICT LIABILITY.

13 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.
14 Literature Reference

3M IF 1.7  3M™ Reflective Sheeting Sign Base Surface Preparation
3M IF 1.11  3M™ Reflective Sheeting Sign Maintenance Management
3M PB 1170  3M™ ElectroCut™ Film Series 1170
3M PB 3430  3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430 with Pressure Sensitive Adhesive
3M PB 3924S  3M™ Fluorescent Orange Prismatic Work Zone Sheeting Series 3924S Sheeting With Pressure Sensitive Adhesive
3M PB 3930  3M™ High Intensity Prismatic Sheeting Series 3930
3M PB 3990  3M™ Diamond Grade™ VIP Reflective Sheeting Visual Impact Performance (VIP) Series 3990
3M PB 4000  3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000
3M Digitally-Imaged Sign Warranty Bulletin
3M™ MCS™ Warranty Matrix for HP Latex 360/365 Printers
3M™ MCS™ Warranty for Traffic Matrix for HP Latex 360/365 Printers
HP Latex 300 Printer Series User’s Guide - available on printer

ASTM Test Methods are available from ASTM International, West Conshohochen, 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/roadsafty