Overview

3M™ Process Colors Series 880I, 880N, and 990 are designed for printing on reflective sheeting when used in the imaging of traffic control signs. These process colors are matched components for specific 3M sheeting products.

3M™ Process Colors Series 990 (“Series 990”) process colors were formulated for use on:

- 3M™ Flexible Prismatic Sheeting Series 3300i
- 3M™ Advanced Flexible Engineer Grade Reflective Sheeting Series 7300

3M™ Process Colors Series 880I and Series 880N (“Series 880I” and “Series 880N”) process colors were formulated for use on all 3M™ Prismatic Reflective Sheeting for durable traffic signs, including:

- 3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430
- 3M™ Diamond Grade™ Fluorescent Workzone Sheeting Series 3924S
- 3M™ High Intensity Prismatic Reflective Sheeting Series 3930
- 3M™ Diamond Grade™ DG^3 Reflective Sheeting Series 4000
- 3M™ Advanced Flexible Engineer Grade Reflective Sheeting Series 7300

See Product Bulletin 880 and Product Bulletin 990 for a description of available colors.

3M™ Flow Additive 892

Description

3M™ Flow Additive 892 is a silicone polymer solution intended to be added to Series 880I, Series 880N, and Series 990 to improve flow characteristics. Occurrences of incomplete color coverage or ink flow (spots where the color does not flow out properly or results in an orange peel appearance) can be reduced by its use.

3M™ Flow Additive 892 will cause non-wets of subsequent inks if screened areas are overlapped. 3M™ Flow Additive 892 is NOT recommended as a flow additive in such cases unless it is added to both inks. For example, when screening 885I v2 on top of 894I v2, do NOT add 3M™ Flow Additive 892 to the 894I v2, or non-wets will occur in the 885I v2. These non-wets can be eliminated with the addition of 3M™ Flow Additive 892 into both process colors.

NOTE

Do NOT exceed the recommended maximum quantity and mix thoroughly. Use only when incomplete coverage of colors occurs.

Usage

Users should begin by adding 5 grams of 3M™ Flow Additive 892 per 1 gallon of process color.

If necessary, up to 19 grams of 3M™ Flow Additive 892 may be used per 1 gallon of process color.

Mix well for 5 minutes using a high-speed power mixer. 3M recommends using a propeller type paint-mixing blade.

Equipment

Table A. Screen Printing Material Compatibilities for Series 880I, Series 880N, and Series 990 Process Colors

Process Color	Sheeting	Thinner	Stencil	Screen Fabric
Series 880I	Series 7300 / Series 3430 / Series 3930 / Series 4000	891I	Lacquer resistant	PE157
Series 880N	Series 7300 / Series 3430 / Series 3930 / Series 4000	811N	Lacquer resistant	PE157
Series 990	Series 3300i / Series 7300	T11A	Lacquer resistant	PE157

Screen Fabric

Use a high grade polyester monofilament screen fabric, in mesh size PE 157. The use of other screen fabric and mesh sizes may not produce satisfactory color, reflectivity, or durability and are not recommended. Screen should be stretched to approximately 20 Newtons.

Stencil

Sign manufacturers must use water soluble lacquer resistant stencil materials (e.g. direct applied plotter cut films and emulsions) to maximize the screened image's durability.

Squeegee

- **Series 880I and Series 880N:** Use a sharp, medium to hard (70 to 80 durometer) rubber squeegee.
- **Series 990:** Use a soft to medium (55 to 65 durometer) rubber squeegee

Screening Method

Apply process colors with a fill pass followed by an impression pass to transfer the process color from the screen to the sign. Raise the screen 1/4 in. (0.6 cm) to 3/8 in. (1 cm) above the table surface by adjusting the frame hinges and by using 1/2 in. (1.3 cm) to 1.5 in. (3.8 cm) soft foam rubber blocks (or spring loaded mechanical devices) under the leading edge, depending on screen size.

Processing Conditions

Store process colors and sheeting in a climate controlled environment for a minimum of 24 hours prior to screen printing. Screen print at temperatures of 60°F (15°C) or above. The sheeting and process color should be at ambient temperature and humidity before processing.

Do NOT mix or apply 3M™ Process Color Series 880I, 880N, or 990 with each other or with any other series of process colors produced by 3M or any other manufacturer.

Mixing

Process colors must be hand stirred or mixed using a three blade mixer or paint shaker. Allow the process color to rest for at least one hour prior to use after mixing with a three blade mixer or paint shaker. Cover containers as soon as possible after mixing and during use.

Storage

Store process colors in tightly closed containers. Colors showing signs of contamination should be discarded.

3M™ Process Color Series 880I, 880N, and 990 have a shelf life of 2.5 years from the date of manufacture.

Thinning

3M process colors are typically screen press ready directly out of the can. Thinners should be added sparingly. Over-thinning may result in screening errors such as colors that do not conform to traffic specifications, non-wets, fisheyes, and ink-triggered cracking. If thinning is needed:

Series 880I Colors

Required: 3M™ Thinner 891I is the required thinner. Thinner usage should NOT exceed 5% by volume (6 oz./gal. maximum).

Series 880N Colors

Recommended: 3M recommends using 3M™ 811N Thinner with Series 880N process colors. Usage of 3M™ 811N Thinner should NOT exceed 10% by volume (12 oz./gal. maximum).

Alternative: 3M™ Thinners Series CGS are more specialized thinners that will slightly increase drying times and should be used if drying in the screen is a problem. Usage of a 3M™ Thinner CGS should NOT exceed 5% by volume (6 oz./gal. maximum).

Series 990 Colors

Recommended: 3M recommends using 3M™ Process Color T11A Thinner ("T11A Thinner") with Series 990 process colors. T11A Thinner is a general purpose thinner that works in most applications. T11A Thinner usage should NOT exceed 10% by volume (12 oz./gal. maximum).

Alternative: 3M™ Process Color 991 Thinner/Retarder is a more specialized thinner that will slightly increase drying times and should be used if drying in the screen is a problem. 3M™ 991 Thinner/Retarder usage should NOT exceed 10% by volume (12 oz./gal. maximum).

NOTE

If possible, mixing and thinning should be done the night before. Prior to screening, hand mix the ink again with a spatula.

Clear Coat

3M does NOT recommend using a clear coat on Series 880I, Series 880N, or Series 990 inks.

Clean-Up Solvents

The following solvents may be used for cleaning screens and equipment:

- Methyl ethyl ketone (MEK)
- Xylene
- The thinner for the appropriate process color series

NOTE

All areas where solvents are used must have proper ventilation. Consult a licensed HVAC contractor for ventilation recommendations.

Rack Drying

Air drying on racks is best done at temperatures above 60°F (16°C) and relative humidity above 35%. Drying rates may be slowed by high humidity, low temperature, poor air circulation, too heavy a coat of color, or excessive thinning.

NOTE

Insufficiently dried screen printing materials may experience blocking, sticking, or severe surface impressions when stored or packaged for shipment.

3M™ Process Colors Series 880 and 990

Newly processed sheets MUST be placed on racks with adequate air flow through the racks (a minimum of 125 LF/min. [38.1 meters/min.]) while they are being filled to rapidly remove and exhaust solvents. Follow these procedures:

1. Rack signs with at least 2 in. (5.1 cm) of unobstructed space for air flow between layers. See Figures 1 and 2.
2. Place fans 4 ft to 6 ft (1.2 m to 1.8 m) in front of the racks directed so that all racks receive horizontal air flow between the layers. Two fans per rack stack are required for most commercial racks.
3. Do NOT place racks in a corner or near a wall where air flow or exhaust is restricted.
4. Series 880N, Series 880I, and Series 990 inks must dry for a minimum of 2 hours between colors, and for a minimum of 24 hours before packaging the finished product.

NOTE

Fans used in screen print areas must be suitable for use in a combustible solvent environment.

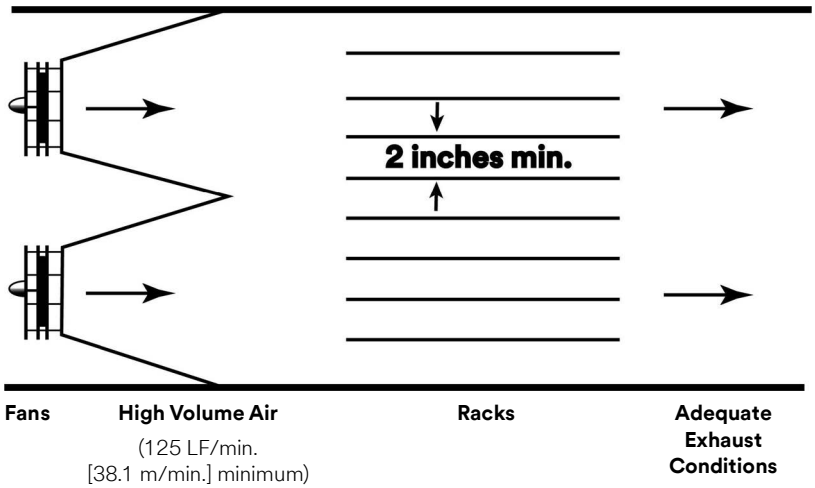

Figure 1. Air Drying Set Up

Oven Drying Procedures

⚠ CAUTION

Consult a licensed HVAC contractor to ensure ovens meet the requirements for use with solvent based inks.

Batch Oven Drying

Screen printed sheeting must be racked individually with sufficient spacing for unobstructed air flow. Ovens must have adequate horizontal air flow throughout the oven (a minimum of 125 LF/min. [38.1 meters/min.]). Fans are an option to provide the necessary airflow in a walk-in oven/drying room.

Table B. Batch Oven Drying Times and Temperatures

Ink Series	Oven Temperature	Bake Each Color	Bake Final Color
Series 880i	105°F (41°C)	30 min.	30 min.
Series 880N	105°F (41°C)	30 min.	30 min.
Series 990	150°F (65°C)	30 min.	30 min.

Conveyor Drying

Screen printed signs and sign faces can be dried in a conveyor oven. Conveyor ovens must provide unobstructed air flow and adequate air exchange. Dry times and temperatures will vary based on individual oven performance. See Table C for typical conveyor oven conditions. A cooling zone must be utilized prior to the packaging station. Verify oven temperatures prior to starting drying.

NOTE

If printed faces curl in the oven, weigh them down or clip them in place to minimize curling.

Table C. Conveyor Oven Drying Times and Temperatures

Zone	Time	Temperature
Flow-out Zone	Minimum 30 seconds	Ambient
Heating Zone	2 minutes	185°F (85°C)
Cooling Zone	15 seconds	65°F (18°C)

Storage

Screen Printed Sign Faces

Screen processed signs must be protected with 3M™ Slipsheeting (“Slipsheeting”) or the sheeting liner. Place the glossy side of the Slipsheeting or sheeting liner against the sign face. Double faced signs must have the glossy side of a piece of Slipsheeting or sheeting liner against each face of the sign.

Unmounted screened faces must be stored flat and interleaved with Slipsheeting, with the glossy side against the sign face. The maximum allowable stack height is 5 in. (12.7 cm).

Screen Printed Signs

Store signs with the glossy side of either Slipsheeting or the sheeting liner against the printed face. Store on edge as shown in Figure 2. Screen printed images must be completely dry before packaging, storage, and shipment.

Figure 2. Storing Signs On Edges

NOTE

Two sided signs must have the glossy side of the Slipsheeting or sheeting liner against each sign face.

3M Related Literature

Always use the most current version of the applicable product bulletin, information folder, and/or other product information. These are available at http://www.mmm.com/roadsafety.

- 3M Product Bulletin 3300i 3M™ Flexible Prismatic Sheeting Series 3300i
- 3M Product Bulletin 3430 3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430
- 3M Product Bulletin 3924S 3M™ Fluorescent Orange Prismatic Work Zone Sheeting Series 3924S
- 3M Product Bulletin 3930 3M™ High Intensity Prismatic Reflective Sheeting Series 3930
- 3M Product Bulletin 4000 3M™ Diamond Grade™ DG^3 Reflective Sheeting Series 4000
- 3M Product Bulletin 7300 3M™ Advanced Flexible Engineer Grade Reflective Sheeting Series 7300

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

Health and Safety

Tools and Equipment Usage

When using any equipment, always follow the manufacturer's instructions for safe operation.

Chemicals

When handling any chemical products, read the manufacturers' container labels and the safety data sheets (SDS) for important health, safety, and environmental information.

Follow this link to obtain SDS sheets for 3M products.

Follow this link to obtain information about substances of very high concern (SVHC) for EU products.

Warranty Information

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Commercial Branding and Transportation
3M Center, Building 223-3N-30
St. Paul, MN 55144

1-800-328-3908
3M.com/roadsafety

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