Process Colors Series 880 and 900 Instructions for Use

Information Folder 1.8 **October 2014**

Replaces Information Folder 1.8 dated July 2010

Description

3M™ Process Colors Series 880I, 880N and 990 have been developed to provide maximum durability, color-fastness and adhesion to reflective sheeting when used in the processing of traffic control signs. These process colors were developed and designed as matched components for specific grades of 3M sheeting.

Series 990 process colors have been formulated for use on 3M™ Engineer Grade Reflective Sheeting Series 3200.

Series 880 process colors have been formulated for use on all 3M™ Prismatic Reflective Sheeting for durable traffic signs.

3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430

3M™ High Intensity Prismatic Reflective Sheeting Series 3930

3M™ Diamond Grade™ VIP Reflective Sheeting Series 3990

3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000

For a description of the available colors, see Product Bulletin 880I, Product Bulletin 880N or Product Bulletin 990.

3M™ Flow Additive 892

3M™ Flow Additive 892 is a silicone polymer solution intended to be added to Series 880 and 990 process colors to improve flow characteristics. 3M flow additive 892 can reduce orange peel, non-wets and fisheyes.

Minimum/Maximum Usage: Begin with five grams of 3M flow additive 892 per one gallon of process color. If necessary, up to 19 grams of 3M flow additive 892 per one gallon process color may be used (typically one capful equals five grams). Mix thoroughly.

Exceeding the recommended dosage of 3M flow additive 892 can result in non-wets, fisheyes and poor adhesion to sheeting.

Note: Shelf life of flow additive 892 is one year.

Equipment

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.

Process Color	Sheeting	Thinner	Stencil	Screen Fabric
Series 990	Series 3200	T11A	Lacquer Resistant	PE157
Series 880I	Series 3200/Series 3940/Series 3990/ Series 4000	891	Lacquer Resistant	PE157
Series 880N	Series 3200/Series 3940/Series 3990/ Series 4000	711N	Lacquer Resistant	PE157

Stencil — Water soluble lacquer resistant stencil materials (e.g. direct applied plotter cut films and emulsions) must be used to maximize screen image durability.

Squeegee — Series 880: Use a sharp, medium to hard (70-80 durometer) rubber squeegee.

Series 990: Use a soft to medium (55-65 durometer) rubber squeegee.

Screening Method

Process colors should be applied to the screen with a fill pass followed by an impression pass which transfers the process color from the screen to the sign. The screen should be raised (off contact) approximately one-fourth (1/4) inch to three-eighths (3/8) inch above the table surface by adjusting the frame hinges and by using a half (1/2) to one and a half (1 1/2) inch soft foam rubber blocks (or spring loaded mechanical devices) under the leading edge, depending on screen size.

Processing Conditions

Store process color 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. It is important that the sheeting and process color be brought to ambient temperature and humidity before processing.

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

Series 990 Colors:

Mixing — Process colors must be mixed prior to use. Hand stirring, three blade mixer or paint shaker are all effective methods of mixing. If the process color is mixed with a three blade mixer or paint shaker, allow the process color to rest for at least one hour prior to use. Cover containers as soon as possible after mixing and during use.

Thinning — Series 990 process colors are typically screen press ready directly out of the can. If thinning is needed, T11A is the recommended thinner. The T11A is a general purpose thinner that will work in most applications. 3M™ 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. Thinners should be added sparingly. Over-thinning may result in screening errors such as non-wets or fisheyes.

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

Series 880I Colors:

Mixing — Process colors must be mixed prior to use. Hand stirring, three blade mixer or paint shaker are all effective methods of mixing. If the process color is mixed with a three blade mixer or paint shaker, allow the process color to rest for at least one hour prior to use. Cover as soon as possible after mixing and during use.

Processing Conditions (continued)	**Thinning** — Series 880I process colors are typically screen press ready directly out of the can. If thinning is needed, 3M™ 891 Thinner is the required thinner. Thinners should be added sparingly not exceeding 5% by volume (6 oz/gal maximum). Over-thinning may result in screening errors such as non-wets, fisheyes and ink-triggered cracking. **Series 880N Colors:** **Mixing** — Process colors must be mixed prior to use. Hand stirring, three blade mixer or paint shaker are all effective methods of mixing. If the process color is mixed with a three blade mixer or paint shaker, allow the process color to rest for at least one hour prior to use. Cover as soon as possible after mixing and during use. **Thinning** — Series 880N process colors are typically screen press ready directly out of the can. If thinning is needed, 3M™ 711N Thinner is the required thinner. Thinners should be added sparingly not exceeding 10% by volume (12 oz/gal maximum). Over-thinning may result in screening errors such as non-wets, fisheyes and ink-triggered cracking. **Storage** — Store process colors in tightly closed containers. Process color shelf life is one year from date of receipt. Colors showing signs of contamination should be discarded.
Clear Coat	Clear coat is not recommended on Process Color Series 900, 880I or 880N.
Clean-Up Solvents	The following companies have solutions and systems to clean screens: 1. Easiway Systems, Inc. 540 S. River St Delano, MN 55328 Tel. 800-950-3279 sales@easiway.com 2. Intercontinental Chemical Corporation (ICC) 4660 Spring Grove Ave. Cincinnati, OH 45232 Tel. 800-543-2075 The following solvents may be used for cleaning screens and equipment. 1. Methyl Ethyl Ketone (MEK) 2. Xylene 3. The thinner for the appropriate process color series. *Note: All areas where solvents are used must have proper ventilation. Consult with licensed HVAC contractor for ventilation recommendations.*

Rack Drying

Air drying on racks is best done at temperatures above 60°F 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: If screen printed materials are not sufficiently dried, blocking, sticking or severe surface impressions of the screened images may occur when stored or packaged for shipment.

Series 990 and 880 Colors:

It is imperative that the newly processed sheets be placed on racks with adequate air flow through the racks (approximately 125 LF/minute minimum) while they are being filled to rapidly remove and exhaust solvents. Follow these procedures.

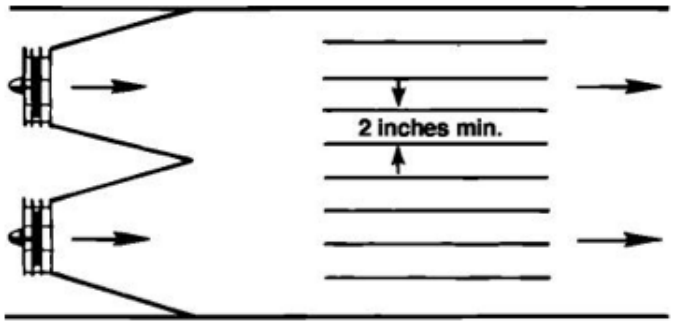
1. Signs should be racked with at least two inches of unobstructed space for air flow between layers. See Figure 1 and 2.
2. Fans should be placed four to six feet in front of and air directed through all parts of the racks with horizontal air flow between the layers. Two fans per rack are required for most commercial racks.
3. Racks should not be placed in a corner or near a wall where the air flow or exhaust is restricted.

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

Minimum Dry Times

	Series 880/990
Between Colors	2 hrs.
Before Packaging	3 hrs.

Figure 1: Schematic Drying Set-up for Air Drying



Fans **High Volume Air** (approx. 125 lin. ft./min. minimum) **Racks** **Adequate Exhaust Conditions**

Oven Drying Procedures

Note: Consult with licensed HVAC contractor to ensure oven meets the requirements necessary 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 (125 LF/minute minimum). Fans are an option to provide the necessary airflow in a walk-in oven/drying room.

Sheeting Type/Ink Series	Bake Each Color	Bake Final Color	Oven Temp.
Engineer Grade Sheeting 3200/Series 990	30 min.	30 min.	150°F (65°C)
Permanent Signing Prismatic Sheeting/ Series 880	30 min.	30 min.	105°F (41°C)

Conveyor Drying

Screen printed signs and sign faces can be dried in a conveyor oven. Conveyor ovens must provide unobstructed airflow and adequate air exchange. Dry times and temperature will vary based on individual oven performance. See table below for typical oven conditions. A cooling zone must be utilized prior to the packaging station. Oven temperature should be verified with the use of an IR thermometer or Telatemps (www.telatemp.com).

Note: Consult with licensed HVAC contractor to ensure oven meets the requirements necessary for use with solvent based inks.

Series 880 & 990	Time	Temperature
Flow-Out Zone	15 seconds	Ambient
Heating Zone	2 minutes	185° F
Cooling Zone	15 seconds	65° F

Note: Adjust oven conditions as necessary to ensure adequate drying.

Storage

Screen Printed Sign Faces

Store sign faces with the glossy side of either SCW 568 or the sheeting liner against the printed face. Maximum stack height — five inches.

Screen Printed Signs

Store signs with the glossy side of either SCW 568 or the sheeting liner against the printed face. Store on edge as shown in Figure 2.

Note: Two sided signs must have the glossy side of the slip-sheet or liner against each sign face.

Screen printed images must be completely dry before packaging, storage and shipment.

Figure 2: Store signs on edge.

Health and Safety Information

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

Literature Reference

See the following product bulletins:
Product Bulletin 3430 — 3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430
Product Bulletin 3930 — 3M™ High Intensity Prismatic Reflective Sheeting Series 3930
Product Bulletin 3990 — 3M™ Diamond Grade™ VIP Reflective Sheeting Series 3990
Product Bulletin 4000 — 3M™ Diamond Grade™ DG^3 Reflective Sheeting Series 4000

Trouble Shooting

Screen Processing Condition	Possible Causes	Corrective Steps
1. Process Color Triggered Cracking	Insufficient air flow across drying rack.	Improve air flow. Use fans to accelerate process color drying. Fans should be positioned to provide horizontal airflow across drying racks.
	Over tensioning during the sheeting lamination process.	Maintain minimum unwind tension during sheeting lamination.
	Flexed sign faces on drying rack.	Use cardboard or other rigid material to prevent sign face from flexing.
	Excessive thinning or reducing.	Thin per ink product bulletin recommendations.
	Incompatible thinners and reducers.	Ensure proper thinner is used.
2. Fisheyes, non-wets, orange peel, and bubbling	Sheeting contamination.	Improve housekeeping.
	Process color contamination.	Do not reuse or recover process color that has been poured onto the screen.
	Excessive flow additive.	Refer to product bulletin for proper use of flow additive.
	Excessive thinning.	Refer to product bulletin for proper use of thinners.
	Contaminated screens.	Make sure screen is clean and emulsion is in good condition. Replace if needed.

FOR INFORMATION OR ASSISTANCE CALL: 1-800-553-1380

IN CANADA CALL: 1-800-265-1840

Internet: www.3M.com/roadwaysafety

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

Traffic Safety and Security Division
3M Center, Building 225-4N-14
St. Paul, MN 55144-1000
1-800-553-1380
www.3M.com/roadwaysafety

3M Canada Company
P.O. Box 5757
London, Ontario N6A 4T1

3M México, S.A. de C.V.
Av. Santa Fe No. 55
Col. Santa Fe, Del. Alvaro Obregón
México, D.F. 01210