



Screen Printing with 3M™ Screen Printing Ink Series 1900 (Line Inks)

Description

The 3M™ Screen Printing Ink Series 1900 are used on 3M Controltac™ Plus, Scotchcal Films and Scotchlite™ reflective sheetings in the fabrication of attractive graphics, emblems and logos. These inks have good weather resistance and excellent colour retention.

These inks should be dried in a conveyor dryer. Air drying is not recommended. When printed onto 3M™ Controltac™ Plus Graphic Marking System for Curtain Sided Vehicles Series 190 these inks must be conveyor dried.

Product Line

The Series 1900 Inks are offered as part of a Matched Component System (MCS™) which consists of the following:

| Ink Series 1900 | |
|-----------------|----------------------------------|
| 1902 | Red Shade Yellow |
| 1903 | White |
| 1905 | Black |
| 1910 | Gloss Toner/Reducer |
| 1912 | Green Shade Yellow |
| 1913 | Yellow Shade Orange |
| 1914 | Dark Green |
| 1916 | Green Shade Blue |
| 1918 | Yellow Shade Red |
| 1920DR | Dirt Resistant Overprint Clear |
| 1924 | Light Green |
| 1927 | Blue Violet |
| 1930 | Matt Overprint Clear |
| 1932 | Lemon Yellow |
| 1933 | Orange |
| 1937 | Red Violet |
| 1943 | Dark Brown |
| 1952 | Transparent Red Shade Yellow |
| 1955ABC | Petrol Resistant Overprint Clear |
| 1967 | Magenta |
| 1970 | Red Shade Blue |
| 1971 | Deep Red |
| 1972 | Transparent Green Shade Yellow |

Note: All inks are lead-free except 1902, 1912 and 1933.

| Clears, Thinners, Premask and Prespace Tapes | |
|--|--------------------------------|
| Overprint Clear | 1920DR High gloss 1930 Matt |
| Thinners for inks & clears | CGS-30 CGS-50 CGS-80 |
| Premasking | SCPM-19 |
| Prespacing | SCPS-100 |

| | |
|------------------------|--------------------------|
| Petrol resistant clear | 1955 ABC See IB3.12.2 |
|------------------------|--------------------------|

Note: The higher the CGS number, the slower the evaporation rate. Matt overprint clear 1930 and petrol resistant overprint clear 1955 ABC cannot be used for 3M™ Controltac™ Plus Graphic Marking System for Curtain Sided Vehicles Series 190 and 3M™ Scotchcal™ Contour Film Series 1100

| Series 1900 metallic pastes | |
|-----------------------------|------------------------|
| 1960 | Small Aluminium Flake |
| 1961 | Medium Aluminium Flake |

Packaging

The line inks and thinners are sold in one US gallon (3.8 litres). The line inks are also available in one litre containers.

Storage

Inks, toner and clear should be stored between 21°C and 32°C (70-90°F) and should be used within one (1) year of the date of purchase.

Ink Coverage

The coverage of thinned inks will vary with the equipment and print parameters used; however, coverage of 30-40 sqm/litre can be expected.

Overprint Clear Coverage

One litre of unthinned overprint clear will cover approximately 60 sqm when thinned to print viscosity, and printed through a 90T screen. Use of less than recommended usage of overprint clear can result in shortened durability.

Stock Preparation

Conditioning of Stock

For best results, sheets should be allowed to stabilise under shop humidity and temperature conditions before a run is started. Any significant variation between storage and shop area conditions, or in shop conditions between start and finish of a printing run may cause sheets to curl or the printing to go out of register.

Stacking of cut sheets should be avoided even when shop humidity is controlled because stack pressure causes uneven humidity absorption or loss with resultant waving or curling of the sheets' edges.

Racking of the sheets individually, liner side up or face to face, overnight in the shop will tend to stabilize them.

It is important during this conditioning that the sheets be supported and kept flat over their entire length and width.

Proper stock conditioning is especially important where hairline registry or multiple coloured markings are to be produced.

Sheet Cutting

If possible, all sheets which are to be screen printed should be cut from the roll in the same direction. Generally, a good rule to follow is to cut sheets with the longest dimension parallel to the printing on the liner.

If hairline registry is required in one direction, and where sheet size permits, sheets should be cut so that the critical dimension is parallel to the liner printing.

Mixing Line Inks

It is recommended that inks be mixed on a high speed power mixer. They should be thinned as necessary and then mixed for another 5 minutes before using.

Toning and Tinting of Inks

Colours may be tinted using 1903 white and toned using 1910 toner.

Toning of the Series 1900 Opaque Colours using 1910 toner should not exceed 50% by weight of the total mixture.

Series 1900 transparent colours (1952 & 1972) should not be tinted or toned more than 50% by weight with either 1903 white or 1910 toner.

Also, do not use more than 50% by weight of any combination of 1903/1910 in a transparent colour formulation. The use of 1920DR overprint clear as a toner is not recommended.

Blending of Inks

1914, 1916, 1970 are semi-transparent and normally are used for toning or blending with other colours to produce tints.

When used full strength or in dark tints, changing to a coarser screen mesh or two screen printing passes may be necessary to produce the required opacity.

Metallic Pastes

The series 1900 Metallic Pastes consists of the following:

| Series 1900 metallic pastes | |
|-----------------------------|------------------------|
| 1960 | Small Aluminium Flake |
| 1961 | Medium Aluminium Flake |

Mixing of Metallic Inks

Guideline for mixing Gold and Silver Ink Formulations

Note: When printing onto Controltac *Plus* 190 film the amount of metallic flake should not exceed more than 8% by weight.

Gold

1960 or 1961 paste can be added up to 12% by weight (before thinning to screening viscosity) to an ink formulation.

The transparent yellow inks 1952 and/or the 1972 are used to achieve a gold colour. Gold inks can be customised by the addition of reds (1918, 1937 and

1971), blues (1916, 1927 and 1970), green (1914) and black (1905).

The addition of reds, blues, greens and black ink (in total) should not exceed 15% of the ink formulations. The ink can be toned up to 50% with the 1910 toner.

Silver

1960 or 1961 paste is added to the toner 1910 at levels of up to 12%. Silver inks can be customised by the addition of reds (1918, 1937 and 1971), blues (1916, 1927 and 1970), green (1914) and black (1905) inks.

The addition of reds, blues, greens and black inks (in total) should not exceed 15% of the ink formulations.

Recommended Mixing Procedure

Add all inks and toner together in suitable container, mix well. Add metallic paste, mix with a propeller mixer. Do not use high shear mixing. If high shear mixing is used, the flake will break down. Thin ink to screening viscosity (30–35 seconds Zahn cup number 5) with CGS–30, CGS–50 or CGS–80. Use immediately. Mix ink just prior to use.

Guide to Printing Metallic Inks

Use a thick (30 micron) indirect stencil film or multiple coating of direct emulsion on the printing side to ensure high resolution and definition of the image.

To keep pigments suspended, frequently stir prior to and during the screen printing operation.

Use a squeegee of 65–70 Shore durometer hardness.

Slightly higher pressure on the squeegee may give better results.

Using a fill–pass between impressions will assist in ensuring complete coverage.

Best results will be seen with a 90T fabric or similar. The mesh opening should not be less than 80 microns.

Mixed metallic inks should not be stored for more than 3–5 days. Storage is not recommended because aluminium flake can react with moisture and produce hydrogen gas.

The overprint clear 1920DR must be uniformly applied. A 90T fabric is recommended.

Ink Adhesion

The Series 1900 Inks and Overprint Clears are designed to provide maximum adhesion to 3M Controltac *Plus*, Scotchcal Films and Scotchlite Reflective Sheetings; however, occasionally decreased ink adhesion may occur due to variables within the screen printing shop or due to a procedural error.

In order to minimize lost time if a problem occurs, it is recommended that each order be checked for ink adhesion at the beginning of the run.

It is recommended that 3M Scotch Brand Tape #610 be used for ink adhesion testing.

Screen Printing

Screen Fabric

Screen mesh recommended is a 90T fabric.

A screen mesh finer than 90T will render less colour saturation than coarser mesh and may result in a significant reduction in durability and opacity.

Screen Frame

Use a metal frame which is large enough to provide a 15 to 25 cm (6–10 inch) well between the frame and the open design area. The screen fabric must be tightly and uniformly stretched and fastened onto the frame.

Stencil

Any type of stencil film or photostencil material may be used which resists ketones and strong lacquer solvents.

Squeegee

Use a sharp, medium to hard urethane or RKS type squeegee. It should be long enough to completely cover the width of the area being printed with a 5cm (2 inch) or greater overlap at each end.

Screen Printing Method

To get a uniform impression, the “off–contact” method of screen printing is recommended. Position the film under the stencil and hold in place by vacuum. Do not use aerosol adhesives or non–wetting of the ink may result.

Prior to screen printing, remove any dust or foreign matter from the fabric and stencil screen and from each piece of film with a “Tack Rag” (varnish impregnated cloth).

Screen Wash-Up

Use a commercially available solvent based screen cleaner.

Clean up of ink and clear from screens and equipment can also be accomplished with CGS-50, CGS-80 thinner or MEK (methyl ethyl ketone).

⚠ CAUTION: When using solvents, follow all manufacturer's instructions and review and follow all health and safety information. Refer to container labels and MSDS's for health, safety and handling instructions.

Screen Opener

Should the screen become clogged or dried with ink, the screen can be reopened by washing using Scotchcal CGS-80 Thinner. Do not use any spray/aerosol "Screen Openers".

Ink Drying Conditions

Suggested Drying Conditions

Conveyor Drying: Dry Ink Series 1900 for a minimum of 25-30 seconds at 60-70°C (140-160°F). Use temperature strips and check the conveyor from side to side.

Air drying is not recommended.

Markings should be checked for dryness following the procedure outlined below.

⚠ CAUTION: Printing onto Controltac *Plus* 190 Curtain Marking Film requires conveyor drying.

Dryness Test

Insufficient drying can result in blocking or severe surface impression. Therefore, it is important to check for sufficient dryness when printing starts.

It is recommended that the following procedures be followed to determine if adequate drying has occurred.

1. This test is used to set jet dryer conditions and approximate dryness.
 - a. Touch a printed sheet face to face.
 - b. Place the touched area close to your ear and separate.
 - c. If the marking is adequately dried, there will be a slight or no discernible sound when the surfaces are separated. If the marking is not sufficiently dried, a crackling sound will be heard.

The louder the sound, the greater the amount of additional drying that will be required.

2. This test is used to definitely determine if adequate drying has taken place.
 - a. Take several printed sheets and place them under a 30 cm (12 inch) stack of film or under a weight of 135 g/cm².

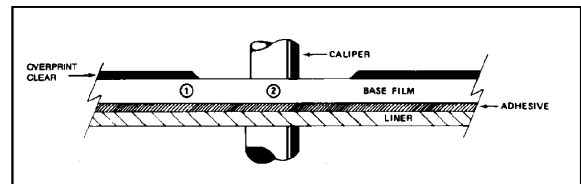
Note: Sheets must not be stacked face to face.
 - b. After 10 minutes, remove the sheets and check for blocking or surface impressions.
 - c. If blocking or severe surface impressions are noted, additional drying is required. If jet drying, either the temperature should be increased or the belt speed decreased.

Overprint Clear Preparation Thickness

In order to obtain the stated durability, the overprint clear thickness after drying must be a minimum of 0.006 mm on the printed areas.

Test for thickness as follows using a micrometre gauge.

1. Apply pressure-sensitive masking tape down the entire length of the film in the centre. Apply overprint clear, remove tape and dry thoroughly.
2. Measure thickness of overprint clear by reading calliper at point (1) adjacent to taped area and then at taped area, point (2) on base material.



3. The difference between these two readings will be the dry thickness of the overprint clear coating.

Application of Overprint Clear

To obtain the overprint clear thickness required above, the following procedure must be followed:

Screen print the thinned overprint clear through a 90T mesh or coarser using a flood or fill pass, followed by an impression pass.

Overprint clears 1930 and 3M™ Scotchcal™ 1955 ABC are neither intended nor warranted for use onto Controltac *Plus* 190 or 3M™ Scotchcal™ Contour Film Series 1100

Thinning of Overprint Clear

| | |
|--|--|
| Screen Printing Overprint Clear | 1920DR / 1930 |
| Thinner | CGS-30/50/80 (add about 1 part to 5 parts Clear by volume) |
| Viscosity | 500-800 Centipoise (about 30 seconds in a #5 Zahn Cup) |

Overprint Clear Drying Conditions

Conveyor Drying: Dry overprint clear for a minimum of 25-30 seconds at 60-70°C (120-160°F). Use temperature strips and check the conveyor from side to side.

Air drying is not recommended.

The same variables that affect drying of the ink also apply to the overprint clear. Insufficient drying will result in blocking or severe surface impressions. Check for sufficient dryness of the clear using the tests for dryness outlined under Ink Drying Conditions Dryness Test.

If markings are to be premasked, several sheets should be premasked and tested using procedure (2) under Ink Drying Conditions Dryness Test.

Premasking / Prespacing

After the markings are thoroughly dry they should be premasked with Scotchcal Premask Tape. SCPM-19 and prespaced with SCPS-100. Refer to Instruction Bulletin 4.3 for detailed information.

Packaging

The inks and the overprint clear must be completely dry before packaging. It is not necessary to slip-sheet printed markings for packaging unless:

1. The protective liner has been imprinted.
2. The faces have been premounted.

When slip-sheeting is necessary, use Scotchcal Easy Release Liner SCW-33. For more specific packaging instructions, refer to Instruction Bulletin 6.5.

Storage of Printed Film

Fabricated markings must be stored flat or on a core with a diameter of at least 13 cm (5 inch), wound film-side out and in a clean area free from excessive moisture and direct sunlight, with ambient temperatures of 30°C (85°F) or less. Markings may be stored up to one (1) year prior to use.

Related 3M Literature

Listed below is related 3M technical literature which may be of interest.

| Subject | Product | Instruction Bulletin(s) |
|---|---------|-------------------------|
| Design of Markings | | 2.1 |
| 3M™ Four Colour Screen Printing Ink Series 1900 | 1900 | 3.11 |
| 3M Overprint Clear & Edge Sealer Series 1955 ABC | | 3.12.2 |
| Scoring and Cutting | | 4.1 |
| Premasking and Prespacing | | 4.3 |
| Storage, Maintenance and Removal of Films & Sheetings | | 6.5 |
| 3M Graphics Warranties matrix | | — |

Health & Safety

Refer to the package label and the Material Safety Data Sheet for health, safety, and handling information on the products referenced in this bulletin. For 3M products, if necessary, you may contact our Toxicology/Product Responsibility Department on 01344 858000.

Important Notice to Purchaser

The 3M products described in this publication are covered by a 3M warranty and limitation of liability.

3M's warranty provides that if 3M finds that goods are defective in material or workmanship they will be replaced or the price refunded at 3M's option but note that 3M does not accept liability for other direct losses (except for personal injury or death) or consequential losses relating to defective products or from information supplied by 3M.

Purchasers and users of 3M products, and not 3M supplying companies, are always solely responsible for deciding on the suitability of the 3M product for their required or intended use.

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For help on specific questions relating to 3M Commercial Graphics Division Products, contact your local Technical Service Representative.

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