

IM Series UV Curable Ink System

Norcote® IM Series is an NVP-Free UV Curable ink system designed for second surface decoration of Polycarbonate and other plastic films used in Insert-Mold Decoration applications. IM Series inks have excellent flexibility and durability and are suitable for use with most Forming, Trimming and Injection Molding processes. For additional suggestions and information, please contact Technical Service. **It is the responsibility of the end user to pretest all substrates with Norcote® products prior to use in production.**

Product Features:

- Excellent Flexibility/Formability
- Excellent Adhesion Bond with Injected Resins*
- Excellent Printability/Definition
- Fast Curing
- Compatible with a wide range of materials
- Compatible with Indigo®
- Resistant to Blocking
- NVP Free

*When used as directed with a Tie-Coat or Two Layer Construction

Printing Recommendations:

All inks are supplied at print-ready viscosity, but should be thoroughly mixed prior to each use. When using a power mixer avoid using dispersion mixing blades, especially with metallic mixes. The IM Series requires the use of a Tie-Coat/Single Layer Construction (SLC) or Two Layer Construction (TLC) to promote ink and resin adhesion.

Do not microwave this product.

TLC / Laminate Construction:

A Two Layer Construction/Laminate construction is a type of construction where a film is laminated to the back of a decorated part. When using demanding or complex tooling, a Two Layer Construction can offer better forming and molding performance.

Single Layer Construction:

Single Layer Constructions are those where the resin is injected directly on a printed ink film-whether it is a tie-coat or graphic ink.

Mesh:

Low elongation monofilament polyester mesh is recommended with mesh counts of 230 to 460 threads per inch (90 to 180 threads per centimeter). Tension should range from 18 to 30 Newtons/cm² on rigid frames. Different mesh counts can be used to adjust ink film deposit to allow for better forming performance depending on the forming tool design. Refer to the Forming/Embossing section in this technical sheet.

Stencil:

Use of UV compatible direct and thin capillary films (13-25μ) are recommended.

Squeegee:

Alcohol based solutions must be avoided as they break down the emulsion. Norcote recommends Press Wash 110 (flash point 113° F), 140 (flash point 140° F) or NSW-824 (flash point 150° F).

Cure & Adhesion:

The IM Series was designed to cure with focused medium pressure mercury vapor lamps. A minimum dosage of 185 millijoules per square centimeter with an intensity of at least 800 milli-watts per inch is recommended to ensure adhesion to most substrates. A curing system with one medium pressure mercury vapor lamp capable of 300 watts per inch output and a focused reflector should provide adequate cure to the ink. Care should be taken not to cure the product too slowly as it may degrade the ink film or substrate. Cure speeds of the IM Series depend on the ink film thickness and the energy output of the lamps. Ink should be cured immediately after printing. As all UV curing systems vary, thorough testing should be conducted.

Coverage:

Ink coverage is based on theoretical ink film thickness. The IM Series is a 100% solids printing ink. Estimated coverage is approximately 425 m² (4,500 ft.²) per gallon depending upon ink deposit.



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Typical Curing Parameters:

2 Focused lamps	1 Focused lamp
200 Watts per inch	300 Watts per inch
80-120 feet per minute	60-80 feet per minute
(25-40 meters per min.)	(20-25 meters per min.)

Material Selection:

IM Series inks have excellent adhesion to a wide variety of polycarbonate, polycarbonate/polyester blends and polyester films. These substrates include:

GE	Bayer	Autotype
Lexan ®	Makrofol ®	AutoForm ®
Tru 2 Form ®	Bayfol ®	Hi-Form ®
Valox ®		
Xylex ®		

The use of ADH-067 may offer adhesion to additional substrates including:

*Acrylic *Polyethylen *Polypropylene

Adhesion to substrates should be evaluated using a Cross Hatch Tape Test (ASTM D3359) incorporating the use of 3M 600 tape. Allow the printed part to cool to room temperature prior to performing the test.

Intercoat Adhesion:

IM Series inks have good inter-coat adhesion properties. It is recommended that intercoat adhesion be monitored when printing four or more passes of ink. Inter-coat adhesion is best evaluated by conducting Cross Hatch Tape Test (ASTM D3359) after each print. Care should be taken to not over-cure the ink when printing more than 5 layers of ink.

Precautions:

Gloves and / or barrier cream is recommended when handling UV inks. Safety glasses are suggested, particularly for areas where ink may be splashed. If skin contact occurs, wash affected area with soap and water-do not use solvents or thinners.

Description of Application:

Insert-Mold Decoration (IMD) is a term used to describe a process in which a plastic film is decorated on the first or second surface, formed to a three dimensional shape, trimmed, and then injection molded with a polymer resin. The resulting part is a three dimensional, decorated plastic component where the graphic image is bonded between the graphic film and injected resin. IMD applications are used in the manufacturing processes for Electronics, Appliance, Automotive, Telecommunications and Medical parts and components. IMD applications can be processed with and without a Two Layer Construction (TLC). For complex tooling designs, a Two Layer Construction may prevent issues with respect to gate wash, ink film cracking and poor resin bond. Parts designed with less complex tooling can be achieved with a Single Layer Construction.

Weatherability:

IM Series inks are intended for use as a second surface graphic ink. IM Series inks are **NOT RECOMMENDED FOR DIRECT EXTERIOR WEATHERABILITY**.

If required, accelerated Life Tests (ALT), Environmental Life Tests (ELT) or other appropriate testing should be conducted. The IM Series inks are designed to meet some ALT/ELT test programs, but differences in test conditions vary for each individual customer. Material selection is a critical factor in ALT/ELT performance of the end product. When designing a part, select a material suitable for the end-use application, and then conduct ALT/ELT testing, if required, with the ink system. This will give the best indication as to material/ink compatibility and performance.

Part Construction:

It is recommended that a Laminate Construction (TLC) or Tie-Coat be applied before further post-print processing. The purpose of these two systems is to promote adhesion between the ink film and the injected resin. Part construction depends on the end-use requirements.

Laminate Constructions:

A variety of materials can be used as laminate films for IM applications. It is recommended that testing be conducted to identify the correct combination of material and adhesive. Results will vary depending on application of the laminating adhesive and laminate film. It is the responsibility of the customer to determine which combination of films and adhesives work best.

Forming / Embossing:

The IM Series has been tested and found to produce good results with many thermo, pressure and vacuum forming processes. Due to the many tooling designs in use, testing parts using a specific forming process is strongly recommended. Best results with forming occur when the correct amount of ink is applied to the substrate. When using complex forming designs, adjusting the ink film deposit can improve performance.

When using a "heated" forming process, a pre-heat is recommended for the printed sheet. In addition, the temperature of the forming tool should be no more than 150° C (300° F). Higher tooling temperatures may activate the tie-coat, if used, causing the sheet to stick to the forming tool. Refer to the substrate manufacturer for guidance on material / forming process compatibility.



Trimming / Die-Cutting:

The IM Series is an extremely flexible ink system providing excellent results under most die-cutting and trimming operations. For guidance, please refer to the substrate supplier and equipment suppliers' processing recommendations.

Injection Molding:

The IM Series inks require the use of a Two Layer Construction/Laminate Film or Tie-Coat prior to being formed, trimmed and molded. The injection molding environment has varying levels of shear, pressure, temperature, and flow. Due to the variations in injection molding processes, identifying the optimal parameters is key to producing a working IM part. Awareness of the variables included in this process will increase the chances for success. These include:

Type of Injected Resin

Mold Tooling / Cavity Temperature

Resin Temperature

Injection Pressure

Gate Design (type and distance from the graphic film) Dwell Time

Tie-Coat:

Water-based or solvent based Tie-Coats may be used, depending on the preferences of the printer. When processing the Tie-Coat, it is recommended that the printer follow the manufacturer's recommendations for pre-press, printing and drying processing parameters. Norcote recommends the use of the following product:

Pröll AquaPress ME®. This product should be processed as directed by the manufacturer. Please refer to manufacturer documentation for correct application guidelines (including stencil, mesh, squeegee, curing / drying recommendations).

Tack:

When properly cured, the IM Series inks will have some level of tack immediately after printing. This is most noticeable in the 1019 Black and 049 Clear products. The tack is inherent in the resin system used in the IM Series and assists with the flexibility and resin bond characteristics of the ink. The level of tack subsides with time and exposure to air. Tack is not indicative of an under-cured ink film. Slower, more intense cure energy and heat can aggravate the tack characteristics. A cross hatch tape test will indicate a cure problem.

For high-speed printing processes, using an alternative stacking practice may prevent blocking problems depending on the type of substrate and the amount of sheets being stacked. Sheet stacks are recommended to be kept to a minimum for these processes. Tack has not been found to negatively affect the in-line printing processes.

Packaging:

The IM Series is available in quart, gallon, 3 gallon, 5 gallon, and kilogram unit containers. Product samples are available in 8 and 16 ounce quantities, if requested. Contact Customer Service for pricing and additional packaging requests. Metallic pastes are available by the pound.

Mixing:

All Norcote® IM Series colors are intermixable.

Hazardous Materials Statement:

The IM Series does not contain N-Vinyl-2- Pyrrolidone (NVP) or any heavy metals. For additional information regarding Industry Compliance Standards, please contact Technical Service.

We recommend testing of the ink system in each production process to verify suitability for use prior to the start of a production run. This includes verification of ink performance in the printing, forming, trimming and injection molding processes as well as post-production testing (ELT/ALT).

Custom Powder/Pigment Additives:

Customers may wish to use a special powder or pigment additive not produced by Norcote®. The use of any powder or pigment additive should be discussed with a Technical Service Representative prior to use to determine material compatibility.

Fluorescent Colors/JZB's:

Fluorescent colors are available upon request. Fluorescent pigments are not light-fast beyond 60-90 days even with an overprint clear. For maximum brightness and color stability 230-260 plain weave monofilament mesh counts are recommended. Please contact our color match department for more information 800-488-8180.

Day-Glo Powders:

Due to post-print processing, the use of Day-Glo powders are not recommended for use with the IM Series inks.



Color Range:

Custom and specific colors can be matched at Norcote® with customer supplied print sample, wet ink sample, Pantone® numbers as well as other recognized standards.

Standard Colors:

IM-022	Red
IM-023	Rhodamine Red
IM-024	Rose
IM-030	Emerald Green
IM-031	Spruce Green
IM-034	Permanent Blue
IM-035	Violet
IM-037	Reflex Blue
IM-112	Lemon Yellow
IM-117	Medium Yellow I
M-2872	Lightfast Orange

Whites, Blacks & Clears:

IM-000	Clear for Powders
IM-002	Mixing White
IM-005	Mixing Black
IM-049	Clear
IM-449	Non-Yellowing Clear
IM-549	Non-Blocking Clear
IM-1019	Opaque Black
IM-1046	Opaque White
IM-1446	Non-Yellowing White

038 Silver Powder:

The 038P is a type of coated powder that is meant to line up the silver particles at the bottom of a printed and cured ink film. Because of this, it is recommended for second surface applications only. This product requires gentle mixing. It is best mixed by hand. Avoid dispersion using (toothed) mixing blades on mixers. The 038 Silver Powder should be mixed with the IM-000 Clear not to exceed 15% by weight. Be sure to thoroughly mix the powder into the Clear. Ability to cure a suspension is related to pigment load and UV exposure. Select mesh counts of 305 threads per inch (120/cm) or lower when printing a metallic mixture. Adhesion and intercoat adhesion to the substrate should be monitored throughout the production run. Higher percent-

Using Metallics:

Metallic pigments will reduce the shelf life of ink mixtures. Actual shelf life will depend upon individual users conditions. As a general rule it is recommended to only mix enough metallic ink for one day.

***040 Gold Paste should be stored between 64°-95°F (18°-35°C) to avoid solidification. If this occurs, reliquify the paste by placing it in an area with a temperature of 77°-95°F (25°-35°C).**

S3100 Special Silver Metallic:

The S3100 Silver Metallic paste is to be used with any IM Series ink. This product has an increased brilliance not typical of the standard metallic pastes. Mesh counts of 305 threads per inch and below are recommended when printing metallic mixtures. Do not exceed 15% metallic paste by weight. Be sure to mix the metallic into the ink thoroughly. For storage, keep the container away from exposure to direct and indirect light and away from heat. The lid should always be tightly secured.

Metallics:

Most metallic pigments work well with the IM-000 Clear. Ability to cure a suspension is related to pigment load and UV exposure. Select mesh with openings large enough to transfer the metallic pigments of choice; generally a mesh count of 305 threads per inch (120/cm) or lower is required. Metallic pigments will reduce the shelf life of IM Series ink mixtures. **RECOMMENDATION: Mix only enough metallic ink for one day.**

Recommended mixing ratios are (by weight):

040 Gold Paste:	up to 20%*
042 Silver Paste:	up to 8%
044 Red Gold Paste:	up to 20%
046 Copper Paste:	up to 15%
038 Silver Powder:	up to 15%
240 Liquid Gold:	up to 30%
243 Silver Metallic:	up to 30%

Select mesh with openings large enough to transfer the metallic pigment of choice; generally a mesh count of 195-305 PW are recommended.

IM-000 and IM-049:

The IM-000 is ideal for use as a base for mixing metallic pastes. The IM-000 should be kept covered when not in use and is not recommended for use as an overprint clear. The IM-049 should be used as an overprint clear or protective layer.

Ink Thinning:

The use of additives to thin the ink is not recommended. The 049 Clear may be used to thin the ink.

Additives:

Check the Norcote Additives list for the products compatible with this ink series. The list is available on our website at www.norcote.com or call us at 800-488-9180 to receive a copy.



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Storage & Available Warranties:

All UV IM Series inks should be stored in tightly closed, black polyethylene containers in an area with the temperature not to exceed 90° F (32.2° C). Do not freeze. Do not store ink below 32F. Avoid direct sunlight and indirect white light. Excess ink from print runs should be stored in separate containers to avoid contamination and is not covered under any warranty. When stored under these conditions, Norcote warrants the products shall be free from defects in material and manufacture until the expiration date shown on the product label. **Norcote® will not warrant any custom colors containing metallic pastes or any inks intermixed with competitor products.** Any warranties provided will be limited to the price paid for the actual products used which give rise to the warranty claim.

This Technical Bulletin is intended to be used for informational purposes only, and is in no way intended to create any warranties or other obligations on behalf of Norcote®. All warranties, terms and/or conditions for a particular product will be specified on the applicable invoice and are only valid upon the creation of a legally binding contract.

Testing:

Due to the inability of Norcote® to anticipate or control the conditions under which the products and information relating thereto will be used and/or stored, Norcote® cannot guarantee the results obtained from using the products. Any suggested uses are merely representative, and because the final product will depend on a number of specific factors, the end user should pretest all substrates with the products prior to use in production.

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