

4000 Series UV Screen Ink

Code Ref: 478

technical information and application instructions

Substrates

PETG, styrene, acrylic, polycarbonate, most rigid & flexible vinyl, static cling vinyl, some anodized metal, rigid & flexible treated polyethylene, rigid & flexible treated polypropylene, and treated fluted polypropylene (Correx)

Note: The surface tension for polyethylene & polypropylene substrates should be at or above 44 dynes/cm.

Various acrylic materials have been tested by Nazdar and found to be suitable:-

Arkema: Plexiglas® G, Plexiglas® MC, Plexiglas® MCS, Plexiglas® SG, Plexiglas® T.

Evonik Cyro: Acrylite® FF, Acrylite® SG, Acrylite® GP.

Plaskolite: Optix®, Optix® LD, Duraplex.

Note: Acrylic recommendations are based on internal adhesion testing under the processing outlined in this technical data sheet. Nazdar & GL do not have control over the substrate manufacturer's process tolerance, changes to formulation, aging of material, masking material, etc. It is recommended for the user to qualify adhesion and finishing processing prior to full production.

End Uses

4000 Series UV Screen Ink is a unique multi-purpose graphic screen printing ink formulated to adhere to a wide range of substrates and provide the flexibility to be suitable for heat-bending, router cutting, and low draw thermoforming for the sign & graphics market.

Product Information

The 4000 Series UV Screen Ink is a one-part, 100% solids UV-curable screen printing ink which exhibits a gloss finish in the Standard Printing Colours, a semi-gloss finish in the Halftone Colours and a flat finish in the Matte Colours. This ink is intended to work well straight from the container on a wide range of printing equipment.

The 4000 Series UV Screen Ink does **NOT** contain N-vinyl-2-Pyrrolidone (trade name V-Pyrol®).

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manufacturing under licence to NAZDAR

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User Information

While technical information and advice on the use of this product is provided in good faith, the User bears sole responsibility for selecting the appropriate product for their end-use requirements. See full disclaimer at the end of the document.

<u>Mesh</u>	140-150T Monofilament polyester mesh is recommended for most applications. 120-165T Monofilament polyester can be used for specialty applications.
<u>Stencil</u>	Direct emulsions and thin capillary films that are solvent resistant, UV ink compatible, and yield a thin ink deposit will work best.
<u>Squeegee</u>	Sharp 70-90 single durometer polyurethane blades as well as multi-durometer blades that produce an even, thin ink deposit will work best.
<u>Coverage</u>	60-100 Square meters/kilo depending upon ink deposit.
<u>Reducer</u>	D564-S082 UV Reducer is to be used to reduce the viscosity of these inks by adding no more than 5% by weight. It is recommended that these inks be thoroughly mixed, and acclimatised to a 18°C - 30°C environment prior to reducing.
<u>Mixing Clear</u>	Mixing Clear is used to reduce the density of colours, or as a clear base for metallic powders (refer to Metallic Colours mixing Guidelines later in this TDS). In process colours use Process Medium to maintain structure.
<u>Clean Up</u>	Use Special UV Screen Wash D574 S016.
<u>Storage</u>	These inks are reactive to light and temperature extremes. Store in a clean area below 35°C sealed tightly in dark plastic containers out of direct sunlight. For maximum shelf life, store ink in ambient temperatures of 15°C to 30°C. Ink taken from the press should not be returned to the original container; store separately to avoid contaminating unused ink. Shelf life is 2 years from date of manufacture.

General Guidelines

<u>Ink Handling</u>	Direct contact with the skin is the primary route of exposure and irritation with UV inks. Therefore, it is recommended that all personnel mixing and handling these products wear gloves and barrier cream to prevent direct skin contact. Safety glasses are suggested in areas where ink may be splashed. If ink does come in contact with skin, wipe ink off with a clean, dry absorbent cloth or rag (DO NOT USE SOLVENT OR REDUCER). Proceed to wash and rinse the affected area with soap and water. Consult the 4000 MSDS for further instructions and warnings.
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Printing

4000 Series UV Screen Inks are formulated to print from the container with excellent flow characteristics. If the need arises to reduce the viscosity, add up to 5% of D564-S082 UV Reducer. The use of a mixer is recommended to thoroughly mix inks prior to printing.

Inks will maintain optimum print and cure performance when the ink temperature is 18°C - 30°C. Temperatures below 18°C will increase the ink viscosity, impairing both flow and cure. Elevated temperatures will lower the ink viscosity, reducing print definition, film thickness and opacity. When the ink is cold, it is best to mix the ink with a high-speed mixer until it returns to the proper temperature, 18°C - 30°C. Add reducer at this point if necessary (as advised above not more than 5%).

Cure Parameters

The 4000 Series UV Screen Inks are formulated to cure when exposed to a medium pressure mercury vapour lamp set at 200 watts per inch with millijoules and milliwatts of:

100 - 150mJ/cm² @ 600mW/cm² for most 4000 Series Colours.

150 - 180mJ/cm² @ 600mW/cm² for Dense Black and White.

When 2 lamps are used for curing a colour, the first lamp should provide the required level of output. Additional cure may be required when printing over a dark or coloured background.

These guidelines are intended only as a starting point for determining cure parameters, which must be determined under actual production conditions. "Undercuring" the ink may result in poor adhesion, lower block resistance and higher residual odour.

To increase mJ levels, slow down the belt speed or scan speed. To increase mW levels, increase the wattage setting of the UV reactor. To optimize mJ and mW output, maintain the bulb and reflector condition and focus to the substrate.

The values mentioned above are representative of measurements taken using an EIT UVICURE Plus radiometer measuring the UVA bandwidth (320-390nm). When measuring the peak irradiance using the UVICURE Plus, it is recommended that a belt speed less than 12 meters per minute be used in order to obtain accurate readings.

These High Performance Inks can be affected by stray UV light in and around a printing facility resulting in the appearance of an ink drying in the screen during the course of a long run. Be aware of skylights, windows and overhead lights possibly curing the ink in the screen. Precautions include the use of light filters that block out the damaging wavelengths.

If ink is left on screen while not printing (lunch breaks etc.) it is advisable to cover with black plastic sheeting.

NOTE: Porous substrates (not recommended) can allow ink to dive below the surface requiring a more thorough cure to overcome the added ink thickness.

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Adhesion Testing

Even when recommended UV energy output levels are achieved, it is imperative to check adhesion on a cooled down print by checking:

1. Touch of ink surface – The 4000 will be smooth and slick.
2. Thumb twist – The ink surface will not smudge significantly.
3. Scratch surface – The 4000 will resist scratching when cool.
4. Cross hatch tape test – Use a cross hatch tool, or a sharp knife to cut through ink film only, then apply 3M #600 clear tape on a cut area, rub down, wait for 1 minute and rip off at a 180 degree angle. Ink should only come off in actual cut areas.

Full adhesion characteristics will be demonstrated within 4 hours after cure.

Warning: Multilayer Printing

UV ink by its nature becomes brittle and inflexible when printed in multiple layers, and after multiple and repeated exposure to curing lamps. This will manifest itself most noticeably when printing onto flexible substrate, where more than 2 to 3 layers of ink are printed on top of each other.

This problem is also more frequently found on highly plasticized substrates where it is possible that some plasticizer has migrated to the surface and this can give a weak ink bond. Unfortunately this failure of adhesion may only become apparent several days after printing.

We must therefore emphasise the importance of testing both a new print construction and new supplies of substrate.

Colour Availability

For the US market NAZDAR has a range of PMS matching colours available, as well as a selection of popular spot colours, 2 or more ranges of Process Colours and a range of single pigment toners.

The demands of the SA market are very different and at GL we hold stocks of the Process Colours and a small selection of popular corporate colours. All other colours are quickly blended in our factories to customer specific requirements.

Weatherability

At full strength and properly cured, 4000 Series colours are formulated to provide 2 years outdoor durability when mounted vertically in Central USA.

Outdoor durability cannot be specified exactly, some colour change and loss of gloss should be expected.

The use of 4000 Overprint Clear increases outdoor durability.

Fluorescent Colours

Available. Fluorescent colours fade quickly with exposure to ultraviolet light. This includes UV reactor exposure as well as outdoor exposure.

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Metallic Colours

Recommended mesh for printing metallics is 120T plain weave monofilament polyester. Mix only enough metallic ink to be used the same day – Chemical reactions in metallic inks may result in viscosity, colour and printability changes over time. Check curing – Metallic colours are possibly more difficult to cure.

When inks are to be printed over a metallic colour, the overprinting ink(s) must be evaluated for intercoat adhesion over the metallic colour before proceeding with the production run. To maximize intercoat adhesion over metallic colours, we recommend that the metallic be printed as late as possible in the print sequence.

Recommended ratios: Metallic Powders

Silvers (aluminium) 8% by weight – 80gms powder to 1kg Clear

Gold (bronze) 15% by weight – 150grms powder to 1kg Clear

Finishing

Stacking: suitable for immediate stacking ink to substrate. Stacking or block resistance is influenced by the degree of cure, the weight or gauge of the substrates and the heat and humidity of the printing environment. Although surface hardness of the cured film has been optimized for handling the printer must assume responsibility for pre-testing and qualifying the parameters for stacking prints prior to each production run.

Cutting: suitable for die-cutting, router cutting, guillotine cutting and laser cutting

Heat Bending: suitable for heat bending at a 180° angle, inward and outward. Areas exposed to high heat may exhibit a harder ink surface.

Thermoforming / Drape Forming: suitable for 8-10cm thermoforming draw and drape forming.

Use with pre-mask: not suitable for most applications. The printer is responsible to pre-test prior to full production printing.

Use with adhesives: not recommended for use with most adhesives. Some non-aggressive screen printable adhesives have shown to be compatible in limited applications. The printer is responsible to pre-test prior to full production printing.

Troubleshooting Guide

Ink Not Curing

Check for proper mesh count.

Check squeegee pressure, angle and sharpness. Too much pressure or a dull edge blade will significantly affect ink film thickness and cure.

Check UV unit for effective millijoules and milliwatts (UV output). Ensure the reflectors are clean & shiny bright silver.

Colour may be too opaque for UV light to penetrate. This can occur when a colour match requires the use of opaque white or black. Reduce the opaque colour with the addition of Mixing Clear until effective cure is obtained.

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Poor Adhesion

Excess ink deposit causing poor through-cure.

Surface contamination on substrate. Wipe a section of the substrate with isopropyl alcohol prior to print, and check adhesion.

Try another type or batch of substrate.

Insufficient cure. Check UV unit for effective millijoules and milliwatts (UV output).

Ensure the reflectors are clean & shiny bright silver.

caution

Please proof this ink, reduced to the consistency you wish to adopt, on a sample of the ACTUAL SUBSTRATE you will be printing BEFORE starting a production run.

Give the proof 4 hours to post cure then check for: Abrasion resistance, adhesion, print appearance and correctness of colour. The adequacy of this ink in these properties cannot be fully established on laboratory equipment on a small scale.

Based on information from our raw material suppliers, these products are formulated to contain less than 0.06% lead. If exact heavy metal content is required, independent lab analysis is recommended.

GL stands behind the quality of this product. GL cannot, however, guarantee the finished results because GL exercises no control over individual operating conditions and production procedures. While technical information and advice on the use of this product is provided in good faith, the User bears sole responsibility for selecting the appropriate product for their end-use requirements. Users are also responsible for testing to determine that our product will perform as expected during the printed item's entire life-cycle from printing, post-print processing, and shipment to end-use. This product has been specially formulated for screen printing, and it has not been tested for application by any other method. Any liability associated with the use of this product is limited to the value of the product purchased from GL.

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Last date amended: 14th July 2014