

Fototex 3D

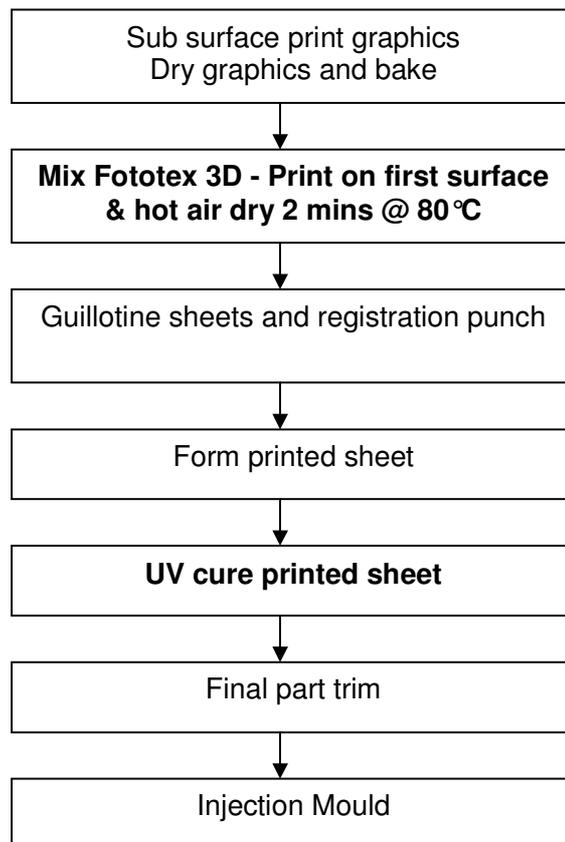
FIM Processing Guide

INTRODUCTION

Fototex 3D is a hybrid cure (solvent & UV) lacquer designed to allow users to create a matt, antiglare or textured finish on parts produced by an FIM process. It is specifically formulated to be fully compatible with MacDermid Autotype's XtraForm film products

This guide is designed to help users to process and to get the best possible performance from Fototex 3D.

Fototex 3D is front surface printed, this process should be performed AFTER the sub-surface graphics printing process, and sits within the overall FIM process as described below:



Mixing

Fototex 3D should always be stirred well before use, and where different finishes of Fototex 3D are being intermixed, proper mixing is of paramount importance.

A low shear mixer, paint mixer or manual paddle stirring is recommended. It is important to minimize heat generation as this can affect the rheology of the lacquer. Generation of air in the lacquer is not normally a problem, as this is removed by the shear action of printing.

White streaks or gels – these are an indication of poor mixing. The mix should look fully homogenous.

Note that this is a solvent based product. You should not use equipment that can be affected by solvents. Cleanliness of equipment and processes is extremely important for this product.

Blending Additions

- The Fine and Supermatt finishes can be fully intermixed.
- We recommend a maximum addition of 60% of Gloss Modifier to Supermatt
- We recommend a maximum addition of 80% of Gloss Modifier to Fine

Note For maximum stain resistance limit Gloss Modifier additions to $\leq 30\%$

Printing Instructions

Work areas should be out of direct sunlight, away from windows and shielded from other sources of UV light such as exposure units. Artificial light should use UV-shielded bulbs.

THE WORKROOM SHOULD BE KEPT CLEAN AND DUST FREE.

Any contamination will cause surface imperfections in the texture. Fototex 3D should not be left on the mesh when not printing. To avoid contaminating unused lacquer, never return used Fototex 3D to the pot, and always replace the lid when not in use.

Note that the product should be stored below 25°C but do not allow to freeze, Allow product to equilibrate with room conditions before use.



Coverage:

Mesh	Product	Coverage per litre
90.40 threads per centimetre	Fototex 3D Fine	38m ²
120.34 threads per centimetre	Fototex 3D Supermatt	58m ²

Variable	Guidelines for equipment/conditions
Printing press	Handbench, semi-automatic, automatic flat bed or cylinder press.
Recommended Thread Count (polyester mesh)	These recommendations are required to achieve sufficient print deposit and quality Supermatt – 90-150 tpc (230-380 tpi) Fine – 62-120 tpc (158-305 tpi)
Recommended Stencil for Fine / Mesh 62-120 tpc	Abrasion and solvent resistant capillary film or emulsion. Autotype Capillex CX / Autotype PLUS 7000 CPS Ultra Cap HD / CPS Ultra Coat 535
Recommended Stencil for Supermatt / Mesh 90-150 tpc	Abrasion and solvent resistant capillary film or emulsion. Autotype Capillex® CX / Autotype PLUS 7000 CPS Ultra Cap® HD / CPS Ultra Coat® 535
Recommended Squeegee type	Square edge, high resistance squeegee e.g. Sericol Duralife RKS HQ
Squeegee hardness	60 – 75 shore hardness (PDS 65-75)
Recommended Screen opener for on press cleaning	Autotype Autosolve Press Wash AF CPS Screen Opener 511
Recommended Screen cleaning for archiving screens for reuse	Autotype Autosolve Press Wash AF55 CPS Screen Cleaner Vx
Recommended: Screen cleaning for reclaiming screens	Autotype Autosolve Industrial CPS Screen Wash A6

The rheology of Fototex 3D is an important factor in the successful printing of the product. It is recommended that processors incorporate a short pause after the print stroke and before the flood coat where possible. This allows excess lacquer to fall off the squeegee and the rheology to recover before the next print. Anti drip systems (drip bars) should be used if available; these prevent any lacquer drips from falling onto the open mesh area and leaving witness marks on the print.



A minimum run in area of 20cm in front of the open stencil area is recommended to prevent print defects. Mesh count will affect both deposit and gloss level.

Because Fototex 3D contains particulates, there is a limit to the size of features that can be resolved by screen printing; this also depends on mesh count and stencil. As a guide Fototex 3D Fine can resolve features down to 650 microns and Supermatt to 220 microns.

Drying

Fototex 3D is a solvent containing lacquer using a uv/solvent hybrid chemistry that must be thoroughly dried through a hot air jet dryer before any subsequent processing.

As with any solvent containing lacquer, drying at too high a temperature can cause skinning and solvent retention, resulting in blistering of the coating.

Drying conditions will be governed by the printed thickness, but as general guidelines:

- Dry for a minimum 2 minutes
- **Do not** dry at less than 80°C or more than 100°C
- **Do not** bake after drying
- **Do not** air or rack dry
- IR driers should be tested individually

After drying, it is common for processors to rack or stack printed sheets prior to the next processing stage. Fototex 3D will remain soft until the print is UV cured, and for this reason racking or vertical stacking is recommended in preference to horizontal stacking. Small stacks (<50 sheets) can be used temporarily (<24 hours) without damaging the printed Fototex 3D, but extreme care should be taken when transporting the stack, and “knocking up” of the stack should be avoided.

Racked prints should also be protected from physical damage and from dust contamination.



Cutting / Guillotining / Punching

Please refer to XtraForm cutting guide

Printed Fototex 3D can be cut using a range of techniques:

- Guillotining
- Punching
- Die cutting
- Matched metal tooling
- Plotter/laser cutting

The guidance given for cutting XtraForm products applies equally to Fototex 3D. In both cases the surface remains soft until UV cured, and care must be taken to avoid all unnecessary contact and prevent mechanical damage to the print. This includes taking care to prevent process guide wheels from making contact with the printed texture.

Forming

Please refer to XtraForm forming guide

Again, the guidance given for forming XtraForm products applies equally to Fototex 3D. Both pressure forming (such as using a Niebling machine), and vacuum forming can be used.

Tool design must accommodate the thickness of both the film and the printed texture, and as in the case of cutting tools, tool wear can be increased by the abrasive nature of the fillers present in the texture. We have no evidence that this occurs, but it is prudent to inspect tooling regularly.

Curing

Please refer to XtraForm UV curing guide

Both XtraForm and Fototex 3D need to be UV cured after the part has been formed to give the required abrasion and solvent resistance. The textured surface can be damaged before it is UV cured. This is especially true once the part is formed. Curing therefore needs to take place directly after the forming process.

In our practical experience the best results are achieved using Fusion UV electrode-less lamps, using H lamps (see www.fusionuv.com). These are available in 300wpi (120 watts per centimetre) and 600wpi (240 watts per centimetre) power. Focused (elliptical) reflectors should be used with the lamp(s) set to place the focal plane of the reflector on the surface of the part. Multiple lamps should be used where necessary to ensure the minimum dose achieved over the whole part.



In our tests we find that for most applications optimum results are achieved with the following equipment:

- 2 x 600wpi Fusion lamps mounted in series (i.e. one after the other along the conveyor)
- Each lamp fitted with dichroic focused reflector modules

On an automatic feed machine this is best achieved by mounting a single or multiple Fusion lamps directly onto the forming machine. Most forming machines run on a stop-start cycle, so it is convenient to use parallel (parabolic reflector) irradiators mounted sufficiently far away from the part to deliver the correct dose over the cycle of the machine. This is relatively easily achieved, but it is important to ensure adequate shielding of the UV light from the operators. The lamp supplier can advise on this and MacDermid Autotype Limited is happy to work together with the chosen lamp supplier to optimise the design of the installation.

Summary of Optimum Conditions

Condition	Optimum setting
Optimum Dose	2J/cm ²
Optimum Intensity	1.5W/cm ²
Lamp type	Undoped H type lamp
Reflector	Elliptical for optimum cure, dichroic for minimum IR heat reflection
Lamp power	240 watts per centimetre. Distance from part determined by lamp focal length
Conveyor speed	10m/m

All measurements refer to UVA measured on EIT Power Puck

On any UV curing unit the optimum cure will be obtained as follow:

1. Ensure lamps are replaced regularly and are in good condition.
2. Ensure reflectors are clean and are in a good highly reflective condition.
3. Ensure the reflector is of the elliptical type.
4. Ensure the lamp to part distance is set so that the light from the lamp is focused exactly on the part surface.
5. Run the lamps at full power. Start with belt speed of 10 m/min, measure the UV output and record.
6. Pass one flat sheet through, then pass through a formed sample and assess the flattening out and form definition.



7. Repeat the above at 9m/min, 8m/min, 7m/min, 6m/min and 5 m/min. Ensure that the sheets are labelled with the belt speed. Assess all the formed samples for deformation or flattening out at each belt speed. Stop once there is evidence of deformation.
8. Assess the parts for cure. This may be conveniently done via an abrasion test, or parts can be shipped to MacDermid Autotype for assessment.
9. The lower the belt speed, the greater the cure, but the more likely the part is to suffer from thermal distortion. The optimum speed is therefore the one that gives acceptable abrasion resistance without distorting the part.
10. If at these conditions the part does not give satisfactory abrasion resistance, then the lamp unit may not be suitable. Contact MacDermid Autotype Limited for further advice.

Troubleshooting Guide

Fault	Cause	Possible remedies
Poor hardness	Under cure	<ul style="list-style-type: none"> • Reduce conveyor speed • Increase lamp power • Ensure lamps are focused • Ensure reflectors are clean and shiny • Ensure product) is not exposed to white light during printing and forming
Distortion or relaxation of the part	Lamps too hot	<ul style="list-style-type: none"> • Increase conveyor speed • Adjust lamp cooling if available • Slightly defocus lamps • Use of dichroic reflectors
Poor solvent resistance	Severe under cure	<ul style="list-style-type: none"> • Reduce conveyor speed • Increase lamp power • Ensure lamps are focused • Ensure reflectors are clean and shiny • Ensure product is not exposed to white light during printing and forming
Coating adhesion failure	Exposure to White light in processing	<ul style="list-style-type: none"> • Use yellow light processing conditions
Witness marks	Dripping lacquer during print	<ul style="list-style-type: none"> • For flat bed printing, use drip bar • For cylinder printing, reduce print speed



Moulding

Please refer to XtraForm moulding guide

In some respects moulding is the simplest part of the FIM process. The main consideration is not on the machine, but on the tooling. Details are given in the XtraForm Moulding guide.

Three processing issues need to be addressed when moulding parts printed with Fototex 3D

- Dust in the mould tool environment can cause visible defects in an FIM part even when conditions seem perfect for non FIM mould operation. The tiny particles of dust become trapped between the film and the tool face and cause a tent effect which is much bigger than the dust particle itself. By contact, in a non FIM process the dust is scoured away and encapsulated, becoming invisible. With a textured surface, it is relatively easy to pick up dust on the part prior to moulding. We advise that the mould face is checked regularly for contamination and cleaned as required.
- Location of the formed part in the mould tool is always critical, and it is of particular importance that the textured surface is accommodated in the tool design, so that it locates cleanly and easily.
- Tool wear. Again, a textured surface can cause some abrasion in tooling, and mould tools must be inspected regularly for wear.



HAZARDS & WARNINGS

IRRITANT, FLAMMABLE, HARMFUL TO THE ENVIRONMENT

ENSURE ALL USERS READ THIS INFORMATION

The product is sold solely for use as an industrial printing lacquer in FIM applications. MacDermid Autotype Limited accepts no liability for use in any other way. This product contains solvents and acrylates which may be irritating to eyes and may cause sensitisation by skin contact. The product is flammable, and heating may generate vapours which may form explosive vapour/air mixtures. Although it has a noticeable odour, the product is not classified as hazardous by inhalation. For further information, please refer to the safety data sheet

HANDLING FOTOTEX 3D

Wear protective equipment (safety glasses, gloves and protective clothing) and ensure good ventilation at all times. Ensure nitrile or butyl rubber gloves are worn throughout processing until the lacquer has been fully cured to minimise the risk of sensitisation by skin contact.

Disposal

Dispose via authorised waste disposal contractor only. Do not place in drains or water courses. The EWC Code for this product is 08 03 12.

Processing

Wear nitrile or butyl rubber gloves, protective clothing and ensure good ventilation at all times.

FIRE PRECAUTIONS

Extinguisher Media: Foam, CO₂, dry powder or water fog

Exposure Hazards: Toxic fumes CO, CO₂, evolved during combustion.

SPILLAGE

Personal Precautions: Wear nitrile or butyl rubber gloves, goggles and overalls.

Environmental Precautions: Protect waterways

Methods for Cleaning: Absorb spillages with oil absorbing material. Do not use sawdust or other combustible material. Dispose via authorised waste disposal contractor only.



FIRST AID

Inhalation: Move the exposed person to fresh air at once. Get medical attention if any discomfort continues.

Ingestion: Immediately rinse mouth and drink plenty of water (200-300 ml). Give milk instead of water if readily available. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs. Get medical attention.

Eyes: Promptly wash eyes with plenty of water while lifting the eye lids. Make sure to remove any contact lenses from the eyes before rinsing. Continue to rinse for at least 15 minutes. Get medical attention promptly if symptoms occur after washing.

Skin: Wash Remove contaminated clothing. Wash the skin immediately with soap and water. Get medical attention if irritation persists after washing.

Shelf Life & Storage

Store in cool, dry conditions and in the original sealed packaging. Shelf Life 6 months.

PACKAGING

Packaged in 750ml metal containers

IMDS Number: 444253637

For further help or information, please contact the MacDermid Autotype FIM Technical Team on 01235 771111

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US 5,108,530

US 5,733,651

US 5,648,414

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