

Description

This bulletin provides basic information on the proper preparation of 3M™ graphics materials and on the application of overlaminates or application tapes using dedicated equipment. In addition, it contains information about drying and deposit times recommended by 3M.

Important Note

All digitally produced Graphics

If available, follow the ink drying or curing recommendations in the applicable 3M™ ink product and instruction bulletin. Otherwise, follow the instructions in this document. Apply the overlaminate as described in this bulletin.

3M Graphic Protection Products

3M offers a variety of graphic protection options. See [Product Bulletin GPO](#) for a list and details of all 3M overlaminates and clear coats.

Graphic Preparation — Sufficient Drying of Inks

All Lamination Methods

Before applying an overlaminate to a printed film, follow the process recommendations for drying or curing listed in this bulletin for the type of ink you are using.

Sufficient Drying of Inks

Once the film is rolled, the solvent from latex, solvent, and eco-solvent inks evaporates very slowly. Trapping these inks contributes to inadequate graphic drying. This can result in graphic failures including curling, increased shrinkage, and adhesion failure, which are NOT covered under warranty.

To improve drying we recommend the use of one of the following drying options

Spool the Printed Film

Loosely spool printed film to allow air to circulate between the layers of rolled film. To further increase air circulation and reduce drying time, place the spooled film roll on a grid with a fan running beneath the grid. Drying times may vary depending on the conditions, so check the film periodically.

Sheet the Film and Place it on the Drying Racks

Cut the film into sheets and place one sheet on each rack. Do NOT stack printed sheets, as this inhibits drying. Place the racks in a drying oven at +70°C, if available, to reduce drying time.

Using Too Much Ink Inhibits Complete Drying

For 3M™ films, refer to the ink-limiting recommendations in your film's product bulletin. If no value is listed, assume a maximum ink limit of 270%.

Workflow

Always build enough time into your process to ensure adequate graphic drying. The poorly dried film may become soft and stretchy, and the adhesive may become too aggressive. This can cause difficulties when applying an overlaminate, rolling the graphic, and applying the film.

Drying Solvent and Eco-Solvent Inks — Inkjet Printing

Printer dryers do not adequately dry solvent inks in the brief time the printed film spends passing through the heater.

Test the Dryness of the Solvent Ink

A sufficient drying of the ink is achieved after approx. 24 h. Depending on the graphic printed and the drying conditions, however, deviations of several hours may occur.

A common method for testing whether ink is dry is to press together, ink to ink, two dark areas of a printed sheet. Apply 140 g/cm² for 15 minutes, hold the sample near your ear and pull the two areas apart from each other. If there is a crackling sound, the ink is not yet dry. Also, check for effects like sticking or dull spots. These are clear indications that further curing or drying is needed.

Drying Latex Inks — Inkjet Printing

Proper drying of latex inks on the printer is essential for achieving durable results and trouble-free post-processing, allowing samples to be safely post-processed immediately after printing. Latex inks should emerge from the printer fully dried. Post-air drying of a wet print will not work, since latex ink drying requires the ink to be heated above the film formation temperature of the latex inside the printer.

Inadequate drying can inhibit overlamine adhesion build-up!

To ensure proper latex ink drying, use the following recommendations:

Media Presets: HP media presets contain all the needed settings to print on a specific media. Download and use the media preset from the following page: www.hp.com/go/mediasolutionslocator.
Environmental Conditions: HP media presets have been specially designed and tested for each printer-media combination.
Recommended environmental conditions: +20°C to +25°C, Humidity 40% - 60% RH.

Important notice for HP 831/871 and HP 881/891

The amount of ink printed is the main key to proper overlamine adhesion. Select a media preset using 100% or less ink density.

Test the Dryness of Latex Ink

For immediate post-processing of latex printed graphics follow strictly the recommendations given above and test the proper drying with the following performance tests:

Visual Test: Check the image immediately after printing. The sample should not be wet or sticky to the touch or have an 'oily' feel when it emerges from the printer.

Rubbing Test: After the visual inspection, wipe the printed sample with a white wet paper towel. Fully dried ink should resist wiping and should not show any stains on the white cloth. If the ink is easily removed by wet rubbing, then it is not dried.

Stacking Test: In some cases, the top surface will appear dry after printing but within a few minutes ink may migrate to the surface leaving an oily aspect. To ensure proper drying, stack at least 12 sheets of the liner to the printed side and let sit for one hour. After 1 hour, remove the stack and check for "oily" stains, wet surfaces, or glossiness changes on high ink laydown areas on each sheet. If any of these occur, then the ink is not properly dried.

If a sample is not properly dried on the printer, reprint the image under a condition that allows complete drying.

Common improvement steps are:

- Increasing the drying temperature in 5-degree steps.
- Increasing the number of passes to slow down printing.
- Reducing the amount of ink printed (media preset with lower ink densities).

Give laminated samples time before applying them. The adhesion bond between the laminate and the printed base film will increase with time. 24 hours minimum for room temperature laminated graphics. 8 hours minimum for graphics laminated with heated rolls (one or two). Lamination temperature: max. +40°C. Lamination speed: maximum 2 meters/minute.

Drying UV Inks — Inkjet Printing

While complete curing of UV inks is essential, over-curing hardens the surface to the point that it becomes difficult to achieve a good bond between the graphic protection and the base film. UV ink continues to cure at a slow rate after removal from the printer. Keep the curing settings as low as possible.

Use this procedure to determine the lowest workable cure setting for your UV inkjet printer:

1. Set the printer to its lowest cure setting.
2. Print a multicolored test sample and complete the cure.
3. Immediately wipe the printed surface with a clean white cloth, lint-free tissue, or cotton swab.
4. If any ink transfers to the cloth, increase the cure setting by one level.
5. Repeat Steps 2 through 4 until no ink wipes off onto the cloth.
6. Record this setting and use it every time going forward.

7. Apply an overlaminate (if using) to the graphic between 1 and 72 hours after UV printing for the best results.

Graphic Preparation — All Lamination Methods

- Bring all graphic materials to print at room temperature. Ideal operating temperature: +16°C to +28°C, 40 - 60% rH.
- The film surface must be free from debris and other contaminants. Contaminants can be trapped between the film surface and the overlaminate, especially for solid-colored films.
- Combining different material types (e.g., PVC soft to PET rigid) can impact the processing mode of the graphic.
- If necessary, moderately heat the roller (max. +40°C) in contact with the printed graphic when processing the laminate to allow optimum flow out and minimize silvering by wetting/filling the textured surface.
- If necessary, prepare a few cloths for solvent wiping (IPA) when processing colored film. Clean the surface of the colored base film. Clean the first two running meters of the material (grab-tab) outside of the machine and handle it with cotton gloves after cleaning.

Lamination Procedure

Equipment

Typical hardware for nip pressure lamination (roll to roll) meets the following design specifications.

- Two pairs of unwinding and take-up shafts/roller
- One pair of 70-durometer (hardness) main pressure rolls
- All or at least one main pressure roller is heatable
- Pressure gauge: depending on hardware showing 50 - 70 psi, 2 -5 bar (200 - 500 kPa), or percentage %: 50 N/inch applied pressure is considered minimal
- Speed control: depending on hardware ranging from 0.1 - 2 m/min to 3 m/min max.

Table systems like “Rolls Roller” exist in various configurations. The quality of the counter pressure/table as well as the roller’s shore hardness can show quality limitations, especially with UV-printed graphics and/or Perforated Window Graphic Film (uneven surface contact) constructions.

Static control devices significantly enhance and improve the process and the final result.

Important Note

The handling procedure outlined in this bulletin is complementary and applicable where possible to any instructions of the manufacturer of the equipment. The manufacturer’s instruction is mandatory. Initial takeover/acceptance protocol and instructions should include details on processing modes “roll to roll” and “roll to sheet”, a nip print as well as processing the full-width roll meeting the final product quality check outlined below. This allows you to fully document the actual condition of the hardware.

Lamination Procedure for 3M™ Graphics

The goal of lamination is to bond to different layers of film with no/minimal tension differences between the layers. Uneven tension is trapped web tension that may result in curling or tunneling of the graphic after lamination or even edge lifting of the applied graphic after installation.

Specified equipment and standard procedures are the key elements for successful lamination. Key elements:

- Process properly wound rolls – no telescoping or misaligned edges.
- Minimum mismatch in roll width, no or just minimal excess (approx. 1 – 3 mm) of overlaminate to the base film.
- Under tension - in (central) - position and wrinkle-free to start.
- Start slow, adjust the tension, and increase speed.
- Supervise
 - nip area (flat wrinkle-free)
 - the splitting spot of the laminate to its liner
 - check minimal tension with finger tabbing/drumming on the web’s entry and exit spans

Final Quality Check of Laminated Product

To judge even tension of graphic film and overlamine in the graphic construction unwind 2 - 4 meters of the finished product flat to a table.

- Crosshatch cut “X”es, with a leg length of 10 cm across the web
- Cut edge circles, with a diameter of approx. 10 cm, at least at the edges and the middle of the web
- Cut rectangles with an edge length of 10 cm and a width of 2 cm in mid-direction (direction of the roll length) and cross-direction (direction of the roll width)



Production with test cuts. Good to see is curling in the middle section – nip print uneven = out of spec

Curling upward: Excess material in the base film

Curling downward: Excess material in the laminate top film.

Inhomogeneous curling across the width indicates inadequate nip print/hardware condition.

Considerations of Materials and Processing Modes

- For UV-printed graphics activate the heater on one pressure roll. Use as little heat as possible, as much as needed to allow the adhesive to fill the uneven, structured ink layer. Preferably thread the printed base film against the heated roller so the adhesive of the laminate is activated (flows out) when facing/nipping the warm printed graphic (base) material to allow optimum flow out. Start at +30°C and increase the temperature to a maximum of +40°C if silvering persists. Reduction of web speed also reduces silvering.
- For lamination of colored films use the unwind shaft with maximum distance to the nip and wipe a moistened IPA-cloth back and forth on the unwind shaft's tangential line to optimize the bond in the final construction. Change the cloth regularly, and run with slow speed to ensure the solvent evaporated prior to reaching the nip. This cleaning maximizes the bond of the final construction e.g., 3M™ Wrap Film 2080/3M™ Wrap Overlamine 8900, 3M™ Scotchcal™ Opaque Graphic Film 100/Scotchgard™ Graphic and Surface Protection Film 8993, etc.
- When laminating soft (PVC) materials with rigid (PET) consider processing roll to sheet by periodically trimming the graphic in the web's cross direction (CD). This makes it easier to judge curling and the final adhesion of the finished graphic's bond builds in a flat position. Minimizes the risk of tunneling.
- When stiff and/or thick materials are processed the diameter of the take-up core should be increased to 6 inches (15 cm). If the equipment does not support larger core diameters, one can use a regular roll with some residual material wound to it to increase the diameter of the take-up roll.
- Strain differences or curling occur easier in stiffer and mixed material constructions and increase the need for a final check of the finished product (crosshatch cutting and its interpretation - see details above).

Storage and Shipping

Please see 3M Instruction Bulletin 6.5 for important details.

Health and Safety

When handling any chemical products, read the manufacturer's container labels and the Safety Data Sheets (SDS) for important health, safety and environmental information.

[Follow the link to obtain SDS sheets for 3M products on 3M.com/SDS.](https://www.3m.com/SDS)

Please dispose of cleaning cloths and paper toweling in a responsible manner. Since regulations vary, consult applicable regulations or authorities before disposal.

IMPORTANT!

When using any equipment, always follow the manufacturer's instructions for safe operation.

Ventilation

Always provide adequate ventilation to remove emissions that may result from the use of heat. Failure to provide adequate ventilation can result in operator exposure.

Air Quality Regulations

Country Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. Check with your country's environmental authorities to determine whether the use of this solution may be restricted or prohibited.

Limited Remedy

Unsuitable End Uses

3M recommended product end uses are listed in each 3M graphics product bulletin. End uses not listed in the applicable 3M Graphics Product Bulletins are typically not eligible for 3M Graphics Warranties. For non-recommended and/or non-warranted end uses or applications, users must test and approve the end uses or applications, assume any associated risks, and acknowledge that 3M has no liability for such end uses or applications. Please contact your 3M representative with any questions about graphic applications, end uses, and warranties.

Limitations of Liability

All questions of warranty and liability relating to this product are governed by the terms and conditions of the sale, subject, where applicable, to the prevailing law.

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