

Thermoforming

Compatible Products

For complete details about graphic construction options, recommended uses and durability, refer to the Product Bulletin for the base film or substrate (media) you are using. See **3M Related Literature** at the end of this Bulletin.

- 3M™ Scotchcal™ Translucent Film Series 3630
- 3M™ Scotchcal™ Translucent Film Series 3632GPS
- 3M™ Diffuser Film 3635-30 (second surface only)
- 3M™ Diffuser Film 3635-70 (second surface only)
- 3M™ Chrome Graphic Film 3635-110
- 3M™ Scotchcal™ High Gloss Overlamine 3640GPS
- 3M™ Scotchcal™ Matte Overlamine 3642GPS

Health and Safety



When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

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



Do not heat the film to more than 380°F (193°C) during the thermoforming process.

Thermoforming at higher temperatures can cause the operator to be overexposed to film decomposition emissions.

Ventilation

Always provide adequate ventilation to remove film emissions that result from the heat of thermoforming. Failure to provide adequate ventilation can result in operator overexposure.

Consult with your heating and cooling contractor and a certified Industrial Hygienist to make sure air flow is sufficient to keep worker exposure below the limits in the 3M Material Safety Data Sheet.

Effect of Heat and Temperature

Be sure that the shop air flow does not cause drafts that can cool the heated plastic sheet before it has been formed.

Excessive heat can cause the film to degrade and may result in the film changing color or failing prematurely when exposed to the outdoors.

In addition to using a temperature lower than 380°F (193°C), do not heat the film for longer than 8 minutes. In areas where the film has been exposed to longer periods of high heat, the surface gloss of the rigid plastic sheet may be altered. After weeding, the change in gloss may be unacceptable for some applications.

Film failure caused by overexposure to heat during the thermoforming process is not covered by the 3M™ MCS™ Warranty. Special heat-sensitive Telatemp™ Tabs are available to make temperature measurements on the surface of the film and plastic sheet during the heating phase of the forming operation. You can call Telatemp Corporation at 800-321-5160 to order the tabs.

Note: An infrared laser thermometer (3M part number IR-750CEXL2) works well when Telatemp Tabs are not visible.

Forms

Use male molds for first surface decorations and female molds for second surface applications.

Keep in mind that the film becomes thinner as it stretches around the returns on a form; the steeper the draft, the thinner the film. The depth of draw should be kept to a minimum. Again, a deeper draw thins the film even more.

We recommend making a test face before you begin production to confirm that the film performs satisfactorily with your equipment and for the intended application.

Film Application



CAUTION

Prevent personal injury due to slipping. The transparent liner on film series 3632GPS can be slippery and difficult to see on walking surfaces. Immediately dispose of the waste liner.

Predrying

1. Dry the rigid plastic sheet before applying the film. Use the method recommended by the plastic manufacturer. Failure to properly dry the plastic can cause bubbling within the plastic sheet and under the applied film during the heating stage of the forming process.

Note: Most acrylic sheeting and high temperature copolyester sheeting need no pre-drying. Consult your plastic manufacturer.

Cleaning

2. Properly clean the substrate before applying the film. See Instruction Bulletin 5.1.

Application Methods

3. Apply the film using the detergent and water method or a roll laminator. See Instruction Bulletin 5.7 for the wet application method.
4. When using a wet application method, re-dry the rigid plastic sheet after applying the film.
 - One film layer: oven dry for about 2 hours at 170°F (77°C), or 1 to 2 days on a rack in an environment of at least 70°F (21°C).
 - Two film layers: oven dry at least four hours at 170°F (77°C).
 - The drying time may vary depending on whether you applied the film with a roll laminator or with a squeegee.

Note: Film series 3632GPS may need additional drying time. If it is not dry enough, it may blister during thermoforming.

5. When using a roll laminator to apply the film, allow the plastic with one layer of applied film to sit for 8 hours or longer to allow drying. Two film layers may require oven drying.

Verify Dryness

6. To verify whether the plastic sheet is dry, make a small test face of the plastic sheet and film using the same method as the original face. Dry the sample and original face pieces. When the sample seems to be dry, place the sample in the thermoforming oven for a full temperature warm-up cycle. If the sample does not show signs of bubbling, the original piece is ready for forming.

Forming Conditions

- Do not heat the film to higher than 380°F (193°C) during the thermoforming process.
- Do not heat the film for longer than 8 minutes. Pre-heating the rigid plastic sheeting with the film applied prior to forming may help in reaching the proper forming temperature faster.
- For polycarbonate sheeting, double-sided heaters may be used to heat both sides of the plastic sheeting simultaneously. This helps the sheet to reach the proper forming temperature faster and reduces the risk of overheating the film.

Note: On sheets of 0.177 thickness, double sided heaters are required.

- Use male molds for first surface decorations.
- Use female molds for second surface applications.
- If possible, do not trap the film between the surface of the mold and the plastic sheeting, which may disrupt the applied film. If the film must be trapped, round and smooth the edges of the mold, for the best results.

Forming of Film Applied to Acrylic or PETG Sheet

- Most types of thermoforming equipment can be used to form the film applied to acrylic or PETG sheeting.
- Make a test face before you begin production to confirm that the film you have selected performs satisfactorily with your equipment and for the intended application.

Forming of Film Applied to Polycarbonate Sheet

- Use extra care when forming film applied to polycarbonate sheets since the sheet has a higher heat requirement.
- Always dry polycarbonate sheet.
- Always make a test face before starting production. Since more heat energy is required to form polycarbonate sheet, it may be difficult to bring sheets to a proper forming temperature before burning the film.
- Using double-sided heaters improves the process since the top heaters can be turned down. This keeps the heat more concentrated on the bottom side of the sheet, away from the film.
- Periodically check the temperature during the heating cycle to make sure film is not being overheated. Failure to follow these instructions may result in overexposure to film decomposition emissions and poor film performance.

Handling Formed Faces

- Faces formed of rigid plastic with the film applied usually remain at elevated temperatures for some time after forming. Handle carefully to avoid damaging the film.
- When the faces have cooled enough to permit handling, the copy and graphics may be cut and weeded from the applied film.

Cutting and Weeding

Cutting and weeding of the film should be completed as soon as possible after forming.

1. Cutting may be done with conventional graphic knives with sharp blades. Use minimum pressure to avoid cutting or scoring the plastic sheeting.
2. Patterns may be made directly on the flat areas of thermoformed faces by pouncing or using chalk or carbon dust. Do not use carbon paper or marking pens, which may leave permanent marks on the film.
3. For debossed or embossed copy, the film can be cut at the required location, such as on the flat area of the letter, the beginning of the return, or halfway into the return.
4. Avoid overcuts at the corner of letters and graphics to prevent light leaks. Overcuts may continue to lengthen or expand, creating noticeable light leaks when exposed to light. Whenever possible, the inside corners of letters and symbols should use rounded corners with the largest radius consistent with acceptable appearance.
5. To weed the film, carefully hold a corner of the film to be weeded and pull it with sharp, short jerks at about a 145 degree angle. Whenever possible, pull the weed away from, rather than toward, the portion of film that is to remain on the surface. If adhesive transfers to the surface during removal, warm the surface slightly during removal to reduce the amount of transfer. Also, varying the angle at which the film is removed helps minimize adhesive transfer.
6. Any adhesive residue left on the surface may be removed by rubbing with your thumb or finger.

Top Coatings

Overlaminates 3640GPS and 3642GPS may be laminated over the translucent films and then thermoformed. This provides additional durability for the colors.

Diffuser Coatings

- A diffuser coating may be applied to the second surface of a clear, formed plastic face. Lacryl™ or Gripflex™ brand paints are recommended.
- Before applying the paint, clean the surface to remove dust, dirt, and other contaminants.
- Apply the diffuser paint to a test panel to assure compatibility and proper results.
- Diffuser films 3635-30 and 3635-70 may be used with formed faces.

Distortion Cut Graphics

- Distortion-cut graphics can be applied and formed similar to distortion-screened faces.
- For second surface application, cut the graphics in reverse.
- The registration procedures used for distortion-screened faces can be used with distortion-cut graphics.
- Diffuser films 3635-30 and 3635-70 may be used with distortion cut graphics.
- For flat thermoformed faces where copy only will be applied, the graphics should be applied after the faces are formed, if possible.

Warranty and Limited Remedy

The information contained and techniques described herein are believed to be reliable, but 3M makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. 3M shall not be liable for any loss or damages, whether direct, indirect, special, incidental or consequential, in any way related to the techniques or information described herein.

3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The following applicable Bulletins provide information and processes you need to properly make the graphics described in this Bulletin. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
3M™ Scotchcal™ Translucent Graphic Film Series 3630	PB	3630
3M™ Chrome Graphic Film 3635-110	PB	3635-110
3M Light Management Films -3M™ Blockout Films 3635-20B, 3635-22B -3M™ Diffuser Films 3635-30, 3635-70 -3M™ Day/Night Films 3635-91	PB	3635
3M™ Scotchcal™ Matte Overlamine 3640GPS and 3642GPS	PB	3640/3642
3M™ Scotchcal™ Clear Graphic Film 8626 ES	PB	8626
3M™ Scotchcal™ Translucent Graphic Film 8628 ES	PB	8628
3M™ Scotchcal™ Luster Overlamine 8519 and 8520	PB	8519/8520
Application, substrate selection, preparation and substrate-specific application techniques	IB	5.1
3M Graphics Center Warranty Brochure	go to www.3Mgraphics.com , Warranties	

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Bulletin Change Summary

Added chrome film 3635-110 to the compatible products. Piezo inkjet printed graphics and electrostatically printed graphics are not recommended for thermoforming at this time. If you have questions, contact us at 1-800-328-3908. See the current recommendation on pre-drying of sheeting (see note on page 2). Black bars in the margin indicate some text has changed or been added.



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