

Avery Dennison® Instructional Bulletin 5.04

Conversion and application of V-4000 Premium Reflective Films

General Information

Avery Dennison® V-4000 Premium Reflective films are highly capable glass beaded retro reflective cast films, which will allow you to complete some of the most demanding vehicle, fleet and signage applications, including applications to moderate compound curves and 3D shapes.

This Instructional Bulletin outlines the parameters to be used when printing, laminating, during application, and for care and maintenance after application.

Film	V-4000 Premium Reflective White Films Easy Apply RS™ and Permanent StaFlat™				V-4000 Premium Reflective Coloured Films Permanent StaFlat™		
Required Overlaminate (when digitally printing)	DOL 6460 High Gloss 38 mic high gloss polyurethane		DOL 1460Z Gloss Conformable 30 mic high gloss PVC film		DOL 1060Z Gloss 50 mic high gloss PVC film		
Conversion Type, Printer and Ink Compatibility							
Latex	Y		Y		Y		
Eco-solvent	Y		Y		Y		
Solvent	Y		Y		Y		
UV Cured*	Y		Y		Y		
Computer Cut	Y		Y		Y		
Conformability							
Channels / Deep Recesses	-		-		-		
Moderate Compound Curves / 3D Shapes	Y		Y		-		
Flat and Simple Curves	Y		Y		Y		
Scratch Resistance	Excellent		Very Good		Very Good		
Removability							
	Easy Apply RS™	Permanent StaFlat™	Easy Apply RS™	Permanent StaFlat™	Easy Apply RS™	Permanent StaFlat™	Permanent StaFlat™
	Excellent	-	Excellent	-	Excellent	-	-
Vertical Warranty^	6 years		5 years		5 years		
Horizontal Warranty^	3 years		-		-		

*For flat surfaces only, except for ICS Performance Guarantee qualified flexible UV curable inks.

^Please refer to Avery Dennison [ICS Performance Guarantee Bulletins](#) for warranted period.

General Considerations

Before commencing application of Avery Dennison® V-4000 Premium Reflective films, there are certain important considerations that need to be adhered in order to achieve the best possible result.

Important Note: Due to the thickness of V-4000 Premium Reflective films, not all compound curves and 3D shapes may be suitable to apply to. The installer should determine the suitability of the product before attempting the installation.

Important Note: V-4000 Premium Reflective films are only recommended for use with DOL 1060Z, 1460Z and DOL 6460 High Gloss overlaminates.

Important Note: As with all graphic films, it is important to avoid using any hard solvents (i.e. IPA (Isopropyl Alcohol) or Avery Dennison Surface Cleaner) directly on the surface of DOL 1060Z, DOL 1460Z and DOL 6460 High Gloss laminates when cleaning or during the application process. Use of these products directly on the surface may cause matting, loss of gloss and premature degradation of the film. If necessary during application, use a soap and water solution in conjunction with the application glove to further reduce friction. For solvent and chemical compatibility, please review **Table 1.1**

Important Note: Avoid storing material laminated with DOL 6460 face-to-face, due to the unique nature of the DOL 6460, the film can bond to itself and may not separate.

Printing of V-4000 Premium Reflective – White Films

- Limit the total amount of ink as much as possible when printing, use the correct ICC colour profile and RIP colour settings to avoid excessive solvent build up and retention in the film, we recommend a maximum of 270%.
- You can download the V-4000 Premium Reflective Profile from avery-ap.color-base.com, providing your printer and RIP combination has been ICC profiled. You can further enhance the colour reproduction by linearising the provided profile using a spectrophotometer.
- Allow material to acclimatise to the print room environment, for best results allow 24 hours.

Drying and Curing

When printing V-4000 Premium Reflective films, the following proper drying and curing times need to be observed to preserve the performance of the film and adhesive:

- For conversion using solvent and eco-solvent inks, a minimum curing time of 24-48 hours for flat applications and 72 hours for conforming and fleet applications is required, before overlaminating.
- Dry immediately after printing by hanging prints vertically to allow solvents to “fall” out of film.
- Drying/curing time will vary depending on location and environmental conditions. If a strong solvent scent is present, or the film is softer than usual the drying process is not complete.
- For conversion using Latex inks, ensure the correct curing settings are used, by checking the printed image for signs of ink rewetting. If there are signs of ink rewetting shortly after printing, try increasing the curing temperature until no longer present. Once the correct drying and curing setting are used, no further curing after printing is required before laminating.

For further information on digital printing of Avery Dennison films, please refer to Instructional Bulletin 4.14.

Computer Sign Cutting of V-4000 Premium Films

When computer cutting V-4000 Premium Reflective films, the following recommendations are provided:

- For thicker films above 140 micron a 60° blade is recommended
- When changing to a different blade angle, an offset calibration will need to be performed
- A very sharp blade is essential to maintain optimum cutting of the film
- Blade pressure should be adjusted, performing a cut test will optimise the blade pressure
- Plotter speed will vary based on age of blade and model of plotter, adjust speed until optimum cutting of the film is achieved
- When weeding the film, use a gentle rocking motion from right to left
- When weeding large letters or graphics, cut the matrix into smaller sections
- Choosing the correct Application Tape is paramount, different Application Tapes will achieve different levels of adhesion to the film, always test prior to use
- When cutting V-4000 Premium Reflective Permanent StaFlat™ It is not recommended to cut letters smaller than 30mm
- When cutting V-4000 Premium Reflective Easy Apply RS™ it is not recommended to cut letters smaller than 60mm

For further information on computer cutting of Avery Dennison films, please refer to Instructional Bulletin 2.01.

Note: Due to the nature of retro reflective material, graphics comprised of multiple pieces of film may show the perception of a color shift depending on the viewing angle and light source. This is not considered a defect in the material. To minimize this effect, cut large letters from a continuous piece of material or use material from adjacent portions of the roll. Also, a small overlap (<.25") or no overlap of the reflective film is recommended to maintain a consistent viewing angle.

Preparation of the Application Surface

- A clean, dry application surface on good condition is absolutely necessary to ensure the proper bonding of an adhesive to the application surface. Refer to Avery Dennison Instructional Bulletins 1.01 Substrate Cleaning and Preparation, and 1.4 Application Methods for specific technical recommendations.

Application Temperature & Environment

- Application temperature is one of the most critical factors in film application.
- Lower temperatures restrict good adhesion properties, which increase the risk of a graphic failure due to low levels of adhesion.
- For V-4000 Premium Reflective films the substrate and ambient temperature must be above 10°C minimum application temperature. For optimal application performance and ease-of-use characteristics, a minimum temperature of 16°C is recommended.
- Easy Apply RS™ films have a broad application temperature range (refer to the appropriate product data bulletin). While the film can be applied at the lower end of the temperature range, more pressure will be needed and it will take longer for a functional bond to be achieved during application. Until a functional bond is achieved, it is risky to remove premask or allow a vehicle to be transported.
- Higher heat and humidity conditions may also make a graphic more difficult to reposition once it has made contact with the application surface. As the ambient or the application surface temperature exceeds our recommended maximum 25°C, Avery Dennison® Easy Apply RS™ installation performance may be limited, especially at temperatures above 30°C.

Note: For all products be sure to read the appropriate product data sheet for details about minimum and maximum application temperatures, recommended substrates, and immediate service conditions before and after application.

Traditional Application Tools

Note: Avery Dennison® V-4000 Premium Reflective films with DOL 1060Z, DOL 1460Z and DOL 6460 High Gloss films can be applied using traditional tools and techniques.

Note: Due to the increased thickness, durability and higher scratch resistance of DOL 6460 High Gloss, you will need to ensure a fresh blade is used when trimming the combined films, frequently snapping your blade will result in optimum trimming and quality finishing (refer to Instructional Bulletin 1.4).

- Squeegee Pro (Blue), Squeegee Pro Flexible (Red) or Squeegee Pro Rigid (White)
- Flextreme Squeegee's
- Application Glove
- Heat gun or Steamer with on demand steam
- Knife – With 30° or 45° blades, for optimum cutting, ultra sharp blades are recommended
- Snitty
- Rivet Brush
- Air Release Tool
- Masking Tape
- Avery Dennison Magnets
- Lasertemp
- Measuring Tape
- Wax/Chinagraph, water based Pencil (chalk like marking pencil is strongly not recommended)

Application and Installation

The following important points should be adhered to when applying V-4000 Premium Reflective films and DOL 6460 High Gloss:

- When using heat to soften the film, an ideal temperature of 40-50°C is required for best results.
- Do not exceed temperatures of 70°C with free unapplied film due to the possibility of the face film making contact and bonding

Important Note: Avery Dennison vehicle wrapping films, including but not limited to: V-4000 Premium Reflective films, do not require the use of adhesive promoter or primer in order to achieve suitable adhesion levels in areas such as moderate compound curves. When properly processed and applied in accordance with Avery Dennison's recommendations in this Instructional Bulletin, these products will remain adhered and free from lifting or popping for the intended life of the film.

Important Note: The use of adhesive promoters or primer will invalidate any warranty statements made in accordance with the ICS Warranty Program.

Important Note: V-4000 Premium Reflective films are to be dry applied only. Do not use water and detergent or a commercial application fluid to position the graphic.

Important Note: As with all graphic films, it is important to avoid using any hard solvents (i.e. IPA (Isopropyl Alcohol) or Avery Dennison Surface Cleaner) directly on the surface of DOL 1060Z, DOL 1460Z and DOL 6460 High Gloss laminates when cleaning or during the application process. Use of these products directly on the surface may cause matting and loss of gloss. If necessary during application, use a soap and water solution in conjunction with the application glove to further reduce friction. For solvent and chemical compatibility, please review **Table 1.1**

- Ensure that the application surface is clean and dry before application of any graphic film. Refer to Instructional Bulletin 1.01 before application of any graphic.
- Ensure application is done in a clean, dry and enclosed location free from dust and possible causes for contamination.

- Be sure the environment, film and substrate are within the temperature range recommended for the film (16-25°C).
- Experiment to find the correct tools and techniques that work best before applying large graphics. Easy Apply RS™ Series films are designed to work with a variety of tools and techniques. Regardless of the tools or technique, it is important to use enough pressure to make sure the graphic firmly adheres to the substrate, approx 5-7kg.
Note: Pre-masked graphic requires additional pressure.
- Use firm, uniform strokes, and overlap all strokes by about 50%.
- Hold the squeegee at a 50-70 degree angle to the surface. A flatter angle will reduce distortion of the film during application.
- Locate where to position graphics and mark the spot using small pieces of masking tape, water based pencil or magnets.
- If the graphic is large, tape or magnet it into position securely and use the hinge method illustrated in Instruction Bulletin 1.4.
Note: To avoid marks in the film, be careful not to place the magnet within area to be applied.
- If the graphic is less than 1m², remove the entire liner. Position the graphic on the marked points using light tacking pressure similar to other Avery Dennison materials.
- Squeegee the film using moderately firm, overlapping strokes, making sure the applicator is flat with the substrate along the entire length of the stroke.
- Remove air bubbles and tenting around rivets by using an air release tool and heat.
- Remove all bubbles using an Air Release Tool or a straight pin. Do not use a knife or blade. This must be done before post heating to avoid entrapped air expanding and damaging the graphic.
- Trim all excess material using a 30° knife blade taking care not to cut the substrate.
- Ensure all edges where the graphic finishes are applied firmly.

Final Squeegee Pass

Note: This is a key final step and will help prevent premature graphic failure due to edge lifting.

- Wait at least 15–20 minutes after the application for initial adhesion to build.
- Re-squeegee all graphic edges, overlaps and seams using firm pressure. Use a squeegee with a new felt buffer to prevent scratching or damage to the decal.
- Re-squeegee is a must on ALL edges of the decal.

Finishing and Post Heating

Important Note: V-4000 Premium Reflective films and DOL 6460 High Gloss requires less heat when post heating. A **post heating temperature of 70°C is recommended**. Please note an absolute maximum temperature of 90°C should not be exceeded.

- Once application has been completed, all areas where the film has been stretched require post-heating.
- Post heating should be done no sooner than 30-45 minutes after application.
- With the use of a heat gun on a high setting and a digital thermometer (Lasertemp), apply heat until the conformed area of the graphic reaches a measured 70°C for DOL 6460 High Gloss and 90°C for DOL 1060Z and DOL 1460Z laminates.
- Post heating must be done the same day as the application.

Note: For further key considerations for vehicle wrapping and conforming applications please refer to Avery Dennison Instructional Bulletin 1.17.

Cleaning and Maintenance

For detailed information on cleaning and maintenance please refer to Avery Dennison Instructional Bulletin 1.8 Vehicle Wrap and Graphics Maintenance.

Important Note: As with all graphic films, it is important to avoid using any hard solvents (i.e. IPA (Isopropyl Alcohol) or Avery Dennison Surface Cleaner) directly on the DOL 1060Z, DOL 1460Z and DOL 6460 High Gloss laminates when cleaning or during the application process. Use of these products directly on the surface may cause matting and loss of gloss. If necessary when cleaning use a damp microfiber towel, or Avery Dennison Supreme Wrap Care Cleaner to remove any light marks or contaminants.

Avery Dennison has tested a broad range of commercially available truck and car wash products for compatibility with the DOL 6460 High Gloss. All tests were conducted at 100% concentration and immersed for up to 24 hours, as opposed to the recommended range of 0.005 - 20% concentration, using recommended washing techniques and times.

For truck and car wash compatibility, please review **Table 1.2**

For the removal of adhesive residue from the surface of DOL 1060Z, DOL 1460Z and DOL 6460 High Gloss laminates, we recommend using the following solvents for the best result: Wax and Grease Remover (Diggers / Septone), White Spirits or Shellite. To remove adhesive residue, simply apply a small amount of the recommended solvent to a microfiber towel and wipe until the adhesive become loose and can easily be removed, avoid using high pressure and abrading the film.

For solvent and chemical compatibility, please review **Table 1.1**

Table 1.1 – Solvent and Chemical Compatibility for DOL Z Series and DOL 6460 High Gloss

Overlamine	DOL 6460 High Gloss 38 mic high gloss polyurethane	DOL 1460Z Gloss Conformable 30 mic high gloss PVC film	DOL 1060Z Gloss 50 mic high gloss PVC film
Cleaning Product			
The below products are recommended for use on the surface of Avery Dennison films			
Supreme Wrap Care Cleaner - Avery Dennison	✓	✓	✓
Supreme Wrap Care Power Cleaner - Avery Dennison	✓	✓	✓
Supreme Wrap Care Sealant - Avery Dennison	✓	✓	✓
The below products are suitable, but not recommended for use on the surface of Avery Dennison films			
De-Solv-it - RCR	✓	✓	✓
IPA - 25% Dilution with water	✓	✓	✓
Mineral Turpentine	✓	✓	✓
Shellite	✓	✓	✓
Wax & Grease Remover - Diggers / Septone	✓	✓	✓
White Spirits	✓	✓	✓
The below products are not recommended or compatible for use on the surface of Avery Dennison films			
Acetone	✗	✗	✗
Adhesive Remover - Avery Dennison	✗	✗	✗
IPA - 100%	✗	✗	✗
IPA - 50% Dilution with water	✗	✗	✗
Methylated Spirits	✗	✗	✗
Oomph - Pasco's	✗	✗	✗
Prep-Vinyl - Viponds	✗	✗	✗
Prep-sol	✗	✗	✗
Surface Cleaner - Avery Dennison	✗	✗	✗

Table 1.2 – Truck and Car Wash Compatibility for DOL 6460 High Gloss

Overlamine	DOL 6460 High Gloss 38 mic high gloss polyurethane
Truck and Car Wash	
Aquawax - Hot Wax Rinse Aid - Autosmart	✓
Brushwash - Concentrated Foam Shampoo - Autosmart	✓
CT18 - Superwash - Chemtech	✓
CT20 - Wash 'N' Wax - Chemtech	✓
G101 - Multi Purpose Non Caustic Cleaner - Autosmart	✓
Heavy Duty Super Wash - SCA / Koala Auto Kare	✓
Heavy Duty Truck Wash - SCA / Koala Auto Kare	✓
JET MPC - Multi Purpose Non Caustic Cleaner - Autosmart	✓
Reaction - Truck, Bus & Car Wash - Batch	✓
Tiger Plus - Heavy Duty Vehicle Wash - Autosmart	✓
Tigerwash - Truck Wash Concentrate - Autosmart	✓
Truck wash - Firefly	✓
Wash 'N' Glow - Concentrated Car Wash & Wax - Batch	✓

Warranty and Limited Remedy

This instructional bulletin describes a technique. The information contained herein is believed to be reliable, but Avery Dennison makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. To the extent allowed by law, Avery Dennison shall not be liable for any loss or damages, whether direct, indirect, special, incidental or consequential, in any way related to the technique of making a graphic regardless of the legal theory asserted.

The above information provides basic information on how to apply pressure-sensitive graphics. The instructions are designed to help ensure success across a broad range of applications. Depending on the size and complexity of applications, a certain amount of expertise is needed.

Professional applicators can be hired to ensure proper application of finished graphics. When mounting graphics in remote geographic areas, professional applicators can offer the added benefit of local service.

Avery Dennison has a vast network of Specialist Installers who have been specially trained and certified in accordance with our recommended techniques.

You can review the Specialist Installer list here: <http://carwrapsanz.com/specialist-installers/>

Consider hiring a professional whenever the application requires:

- Multiple panels to be registered
- Complex surfaces, such as rivet and corrugated trucks
- Harsh environmental conditions (i.e. outdoor applications in high heat climates)
- Remote geographic locations

For further information, contact your local Avery Dennison representative.