Latex 3000 – Tips and Tricks

Getting the best results with self-adhesive vinyl on the HP Latex 3000 printer

Self-adhesive vinyl (SAV), otherwise known as pressure-sensitive adhesive (PSA) vinyl, or simply 'vinyl', is a common substrate used for a wide variety of both indoor and outdoor applications. It may be best known for its use in vehicle wraps and fleet graphics.

This document provides tips and tricks for getting the best results from the HP Latex 3000 Printer when printing on self-adhesive vinyl.

Some of the common types of vinyl are:

- **Monomeric Calendered Vinyl** – ideal for short-term applications on flat surfaces. Monomeric vinyls are also the most economical vinyls.
- **Polymeric Calendered Vinyl** – higher quality than the monomeric types, polymeric vinyls have greater durability and more conformability, making them suitable for slightly curved surfaces.
- **Cast Vinyl** – manufactured using an extrusion process, cast vinyl is thinner and far more conformable than calendered vinyl, making it ideal for wrapping the complex 3D surfaces found on cars and other small vehicles. Cast vinyl also has a longer life span than calendered vinyl.
- **Perforated Vinyl** – this type of vinyl is used for window graphics, for example on buses and trains. While the graphic is clearly visible from the outside, passengers can see out unobstructed.

- **Static Cling** - vinyl film that sticks / clings to smooth gloss surfaces such as glass, smooth plastic and shiny metal surfaces without any adhesive and can be removed without leaving behind any residue.

Vinyl will often be laminated with a clear film overlaminate before application, especially when the application is expected to last for many months or years, which is often the case for vehicle graphics. Short term applications may be done unlaminated, due to time and cost pressure, and where durability requirements are lower.

NOT covered by this document

For PVC banners please refer to the separate document "Getting the best results with PVC banners on the HP Latex 3000".

HP Media Solutions Locator

Visit the HP Media Solutions Locator (**www.hp.com/go/mediasolutionslocator**) to access a database of media presets and ICC profiles available for the HP Latex 3000. Use the HP database to check for media resources before printing on a new substrate, or to discover new media possibilities for the HP Latex 3000. The HP Media Solutions Locator is continually updated with new entries, so be sure to check it regularly.

Information about type, grade and regional availability is provided for each media reference. In addition, note the *classification* level:

- **HP** – Original HP media have been designed as an integrated system with Original HP inks and HP printers for optimized performance.
- **ColorPRO** – these media have been engineered with ColorPRO Technology to deliver color excellence in digital printing. For more information, refer to **www.hp.com/united-states/consumer/colorpro/learn/large-format**
- **Certified** – certified compatibility with specified HP Latex printers and inks. Certified media testing is based on key areas such as print quality, printer-media interaction, and image processing and handling.

Many other profiles are available in the Media Locator. Those media without a specific classification level have passed basic tests on printer compatibility and print quality but are not certified by HP.

Note: When using media presets and/or ICC profiles from the HP Media Solutions Locator, always check the quality and throughput they deliver before printing final jobs. You can then adjust to your specific requirements and preferences, if necessary.

Roll weights supported

The majority of SAV rolls are 1.6 m (63 in) wide or less. Although wider rolls can be found, they are quite rare due to the physical difficulty in applying larger widths to walls and vehicles.

In dual roll configuration, the maximum roll sizes and weights that can be loaded onto the HP Latex 3000 are:

- Maximum roll width: 2 x 1.6 m (63 in)
- Maximum roll weight: 2 x 70 kg (2 x 155 lbs)
- Maximum roll diameter: 30 cm (12 in)

Maximum roll length will depend on the width and grammage of the substrate. As a guide, the maximum roll size that can be printed in dual roll configuration are:

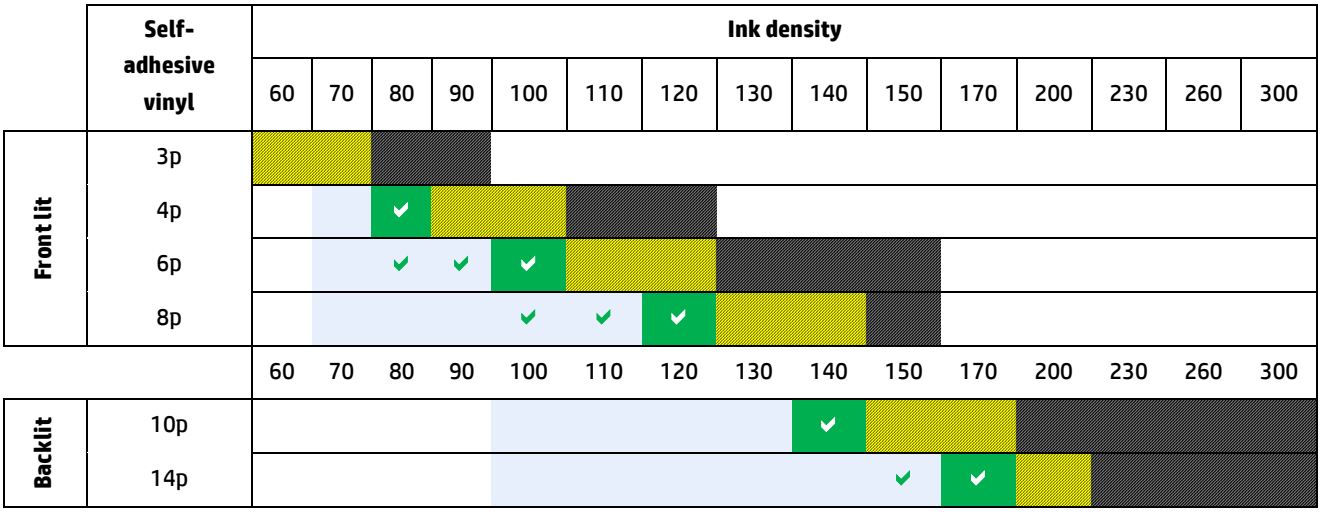
- Two rolls of SAV, each 150 m (450 ft) long by 1.6 m (63 in) wide
- Two rolls of SAV, each 200 m (650 ft) long by 1.4 m (54 in) wide

In single roll configuration, the maximum roll weight is 160 kg (350 lbs).Always check the roll weight to ensure that the spindles, dual roll center support, and printer are not overloaded, as this can cause image quality defects and may damage the printer.

Recommended solution space

When selecting a print mode to use, it is always recommended to start with one of the generic print modes offered by the printer. These generic modes have been tested on a range of media and provide an optimal balance between image quality and throughput. For reference, generic/default modes are shown in the table below.

Although generic print modes are recommended, the printer has been designed to provide advanced operators with the flexibility to be adjust and fine-tune settings as required. In this case, use the preferred solution space shown below to select a working point from the range of throughput and ink density configurations. To move to a different position in the table, clone the generic preset or run the Add New Media Wizard (Media > Create). This will allow you to edit the newly created substrate.



Recommended print mode for this substrate type.

Alternative print modes for this substrate type.

Available but setting adjustments may be required to achieve the correct image quality. Risk of condensations and exceeding curing capacity for long jobs.

Available but high risk of condensations, exceeding curing capacity or media wrinkles.

Despite being available, throughput or saturation might be poor.

Recommended settings

For most conditions and materials, the following settings form a robust setup. These values are included in the generic print modes, and are provided here for your reference. It is important to note that cast and calenderer vinyl have different settings recommended:

- **For Calendered Vinyl**

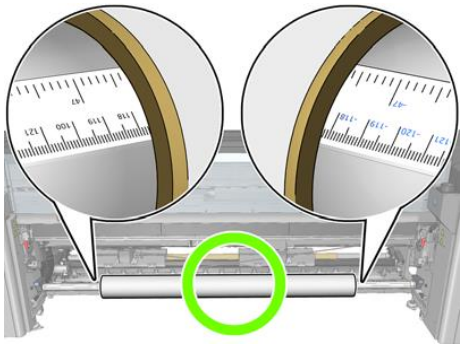
Media Input Tension	60 N/m
Media Output Tension	50 N/m
Vacuum	15 mmH_2O
Optimizer	12%
Curing Temperature	85°C to 90°C depending on number of passes
Drying Power	50% to 75% depending on number of passes

- **For Cast Vinyl**

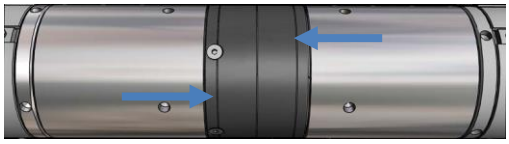
Media Input Tension	35 N/m
Media Output Tension	30 N/m
Vacuum	10 mmH_2O
Optimizer	12%
Curing Temperature	85°C to 90°C depending on number of passes
Drying Power	50% to 75% depending on number of passes

Media loading

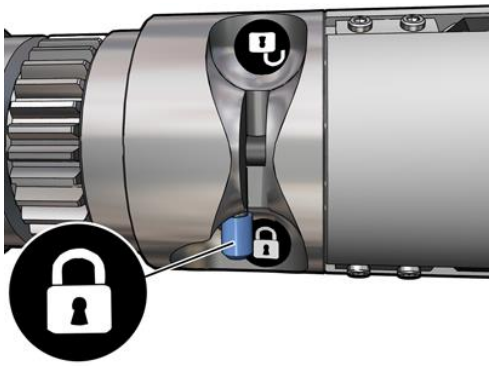
It is important to load media straight and without skew – this will avoid wrinkles forming during printing, which may cause printhead smears and crashes. To load media straight, use the rules marked on the spindles to ensure that the roll is accurately centered and aligned on both the input spindle and the output spindle.

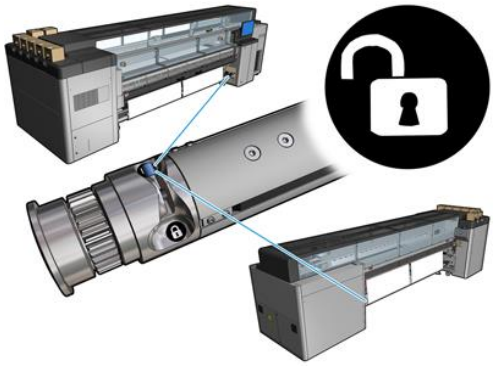


When loading rolls in dual roll configuration, always ensure that the rolls, at both the input and the output, are loaded by aligning the edges of the substrate with the groves present at each side of the dual roll spindle's center mark.



Improper alignment of the rolls in dual roll configuration could lead to excessive skew in the output that would cause wrinkles and even smears in the image. Otherwise, remember that in dual roll configuration, it is recommended to pass the media from the input to the output with the differential locked. This helps avoid uneven tension between the rolls when trying to print, which could be difficult to overcome without loading the rolls again. Once the rolls are loaded, remember to unlock the differential on both spindles in order to proceed with the substrate loading procedure.





In dual roll configuration, it is always recommended to print using the dual roll center support, and to ensure that it is properly calibrated in height. An incorrect height calibration could lead to wrinkles and smears on the printed jobs, or even crashes at the substrate edges.

Tips and tricks to manage the usage of the center support include:

- Periodically ensure that the height of the supports is calibrated and correct. Typically, it will only need to be adjusted when the printer is installed and if the printer is moved from its original location.
- When loading rolls in dual roll configuration, position the center supports under both spindles before the media is passed to the output side and attached to the output cores.

Some lower-quality rolls may be poorly wound onto the cores during manufacturing, resulting in skew and telescoping during printing. This may lead to smears and other image quality issues. The maximum tolerated skew or telescoping according to Latex 3000 printer specifications is 5mm (0.197 in).

Tips and tricks to manage such imperfections include:

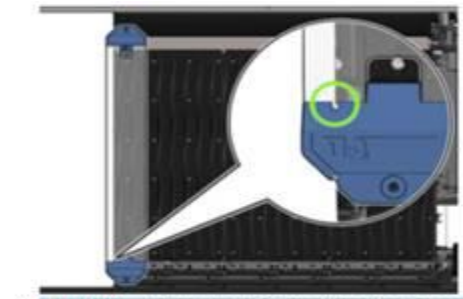
- Try to eliminate telescoping by using a straight edge pushed up against the ends of the roll.
- Print in roll-to-freefall or roll-to-collector configuration to reduce the risk of wrinkles forming during printing.
- Increase tensions and vacuum following the table below until a suitable output is obtained. Beware that the risk of physical marks or IQ defects due to improper media advance increases when moving away from the recommended configuration.

	Calendered Vinyl			Cast Vinyl		
	Vacuum	**Input Tension**	**Output Tension**	**Vacuum**	**Input Tension**	**Output Tension**
Recommended	20	80	80	10	40	30
Alternative i	20	80	85	10	50	40
Alternative ii	25	80	85	15	60	55
Alternative iii	25	90	95	20	75	80
Alternative iv	25	100	100	25	80	85
Alternative v	30	100	100	30	100	100

Using edge holders

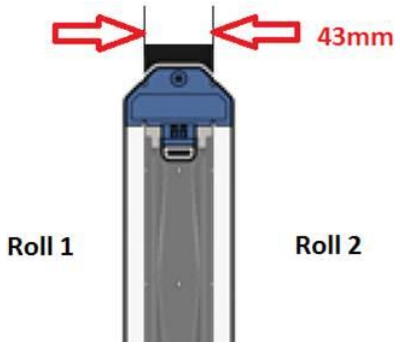
The substrate edge holders prevent substrate edges from lifting up and jamming while printing.

Install edge holder strips carefully and ensure that the cut-outs are aligned with the edge of the media (see diagram below). Incorrect placement may lead to wrinkles or smears, or even a carriage crash with the media edge holder.



CAUTION: Wrongly positioned edge holders could severely damage the printheads and carriage.

- Make sure that input rolls have no skew or telescoping. Rolls with skew or telescoping can cause wrinkles or smears, as the media is likely to crash with the edge holder fixtures or leave the edge holder strip pressure zone.
  Note: When using edge holders, prints should have a minimum margin of 10 mm (0.39 in).
- Edge holders are recommended when printing in dual roll configuration. Make sure that the rolls are positioned with the correct spacing (43 mm/1.7 in), so that a central edge holder can hold both rolls with the cut-outs correctly aligned.



- When printing in single roll configuration, edge holders are only recommended when printing a full width 320 cm (126 in) roll. Substrates with widths less than 254 cm (100 in) can usually be printed without using edge holders.
- Edge holders are not recommended when printing on substrates with thickness greater than 0.4 mm (15.7 mil) since edge lifting is unlikely. Edge holders cannot be used on substrates thicker than 0.7 mm (27.6 mil)

IQ and application tips and tricks

Dimensional accuracy of printed output

Dimensional accuracy of printed output is important in applications such as vehicle graphics where panels or tiles are placed edge to edge. Most self-adhesive vinyls, particularly calendered ones, tend to shrink when heat is applied. As a result, the printed output may not have the same dimensions as the original file in either horizontal or vertical directions, or even in both.

This material behavior can lead to two effects or inaccuracies:

- A constant level of contraction in all printed images.
- Contraction variability between printed images.

The average contraction in a generic calendered self-adhesive vinyl is around 2 mm/m with a variability of ±1.5 mm/m. Consequently, the maximum expected difference between two printed outputs could be, in the worst case, around 3mm/m.

Tips and tricks to minimize this effect are:

1. Compensate for the average contraction of the printed output using a scaling factor in the RIP software. To obtain a value for this scaling factor, compare the measured dimensions of a printed image to the expected ones (the size of the image file). The ratio between these two should be used as scaling factor. To achieve the best performance, adjust the RIP's scaling factor for each media roll.
2. If you have more than one printer, then better dimensional accuracy will be achieved by printing all the panels on the same printer.
3. When printing in dual roll configuration, print the jobs which require better dimensional accuracy (e.g. tiles that will be applied together, or copies of the same image), in the same queue/roll.

Color Consistency

Tiling applications usually require good color consistency between adjacent panels/tiles. The color variation within a job printed with the HP Latex 3000 has been measured to be ≤ 2dE2000 for 95% of the colors.

To ensure optimal color consistency across tiles, make sure you follow these tips and tricks:

1. Color matching is also dependent on external factors. Operating conditions (temperature and humidity) should be kept constant during the printing of the entire job. If a large job is being printed in panels, more than one roll may be required. All rolls should be from the same batch, and stored under correct conditions according to the manufacturer's specifications.
2. Ensure that printheads are aligned, printhead check and clean completed, color calibration completed and media advance calibration completed. If any printhead changes are required during the job, printhead alignment and color calibration should be done.
3. Print adjacent plans on the same roll, and as close together as possible in the queue.
4. If using more than one printer, ensure good color calibration between printers:
    - Run color calibration on one machine.
    - Export the media preset from that printer through the embedded web server, and import the media preset on the rest of the printers.
    - Run color recalibration on the secondary printers.

Poor image quality due to plasticizer migration

Some lower quality vinyls contain high levels of plasticizer – these additives are used to increase the flexibility of the substrate. Over time, the plasticizer will migrate to the surface of the media and affect the wettability of the surface, resulting in poor image quality, uneven distribution of the ink with severe pinholing, and pronounced coalescence in homogeneous area fills.

Note: rolled media may also deteriorate over time, especially when exposed to high temperatures (for example during transportation and storage).

The severity of the image quality issues related to plasticizers can vary considerably. In some cases it can be difficult to differentiate image quality issues caused by plasticizer migration from other root causes, such as poor printhead alignment or an ink level that is too high. One way to determine whether plasticizer migration is the cause of poor image quality is to clean a small portion of unprinted media with isopropyl alcohol (IPA), to remove any plasticizer, and then run a test print. If there is a significant difference in coalescence between the cleaned and not-cleaned areas, then the issue is very likely related to plasticizer migration.

System parameters to minimize impact of plasticizer migration

There are three system parameters that can reduce image quality issues caused by plasticizer migration.

1. Higher drying lamp power → partially evaporates plasticizer before printing.
2. Higher optimizer usage → better coalescence control.
3. Higher number of passes → multiplies the effect of the first two parameters.

All three parameters can be combined to reduce image quality issues, but in most cases they will not reach the level of 'defect free'. In cases with minor plasticizer migration, an overall image quality equivalent to an outdoor mode may be achieved by adjusting only the first two parameters. In more severe cases, however, an additional reduction in throughput will be needed to achieve an image quality close to outdoor quality.

General recommendation for substrates with confirmed image quality issues due to Plasticizer Migration:

Minimum:
Lamp power to 75% and Optimizer usage to 24%
Additional:
Number of passes +2 (4 pass to 6 pass to 8 pass)

Ink Smears while printing

Due to the different responses to heat from the vinyl film and the cellulose liner, self-adhesive vinyls can form wrinkles in the printing zone and lead to ink smears and head crashes. Wider rolls (>64inch) are more likely to suffer from this.

When facing this kind of media deformation, consider adjusting the system parameters using the following guidelines:

1. Higher Input/Output Tension → Stretches the media in the printing zone.
2. Lower Curing Temp. → Reduces media contraction.
3. Blank space between jobs → Avoids printing on preheated media and/or media that has absorbed humidity through the liner.

In the event of smears only occurring at the beginning of jobs or the beginning of the queue, consider activating the settings “Job Gap (350mm)” and/or “Start of queue gap (1200mm)”. These settings leave a blank space before jobs to avoid printing on media areas that have previously passed through the curing zone, since they may suffer additional expansion and generate wrinkles. To minimize media waste and avoid transition processes between jobs, **nest your jobs together** to have them printed as one.

Note that printing in dual roll configuration usually requires higher tension values than single roll to avoid wrinkles in the print-zone.

When printing on **wide media (>64inch)**, in the case these parameters do not solve the issue completely, or there are other IQ defects, **consider using narrower rolls and dual roll configuration**.

Display permanence

In testing performed by the HP Image Permanence Lab, outdoor prints achieved display permanence of up to three years when unlaminated, and up to five years when laminated.

Outdoor display permanence was tested according to SAE J2527, with HP Latex Inks on HP media; in a vertical display orientation in simulated nominal outdoor display conditions for selected high and low climates, including exposure to direct sunlight and water; performance may vary as environmental conditions change. Laminated display permanence was based on the use of HP Clear Gloss Cast Overlaminate. For more information, see **www.hp.com/go/supplies/printpermanence**.