

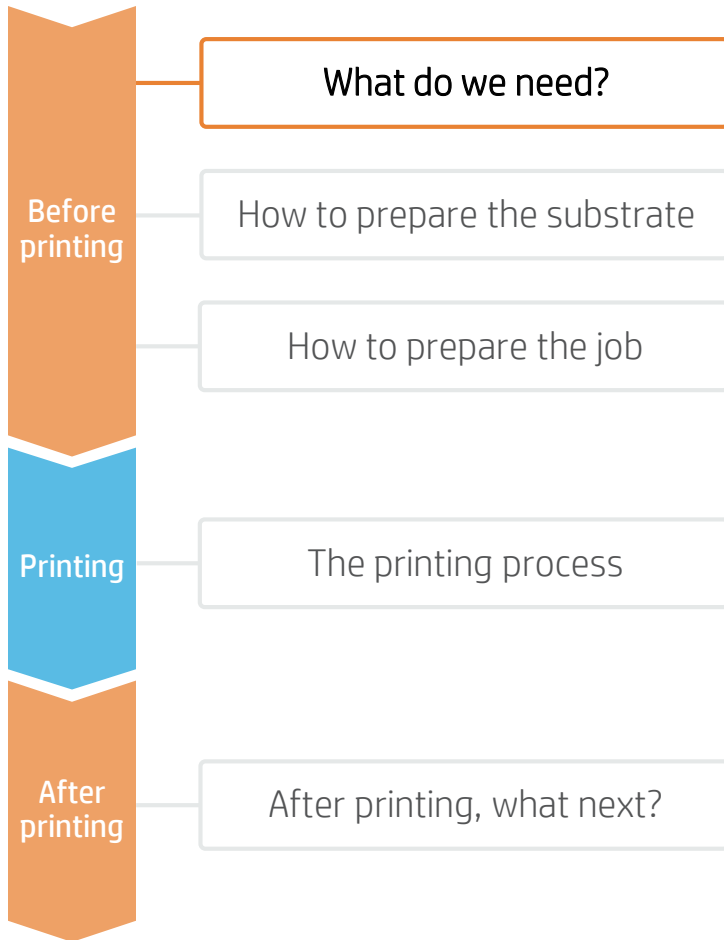
# How to print on acrylic boards (PMMA)

This document will explain how to print on acrylic boards of different types and thickness.

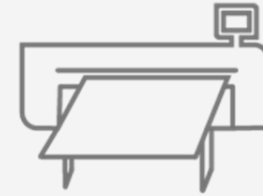


# How to print on acrylic boards

## What do we need?



Acrylic boards



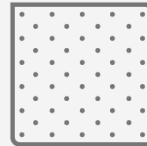
HP Latex R Series Printer



Software tools (RIP, image editor, etc.)



Cutting device



Anti-static cloth



Gloves



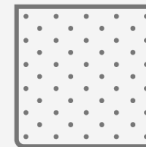
Standoffs (optional)



Glue (optional)



Primer (optional)



Lint-free cloth (optional)



Protective goggles (optional)



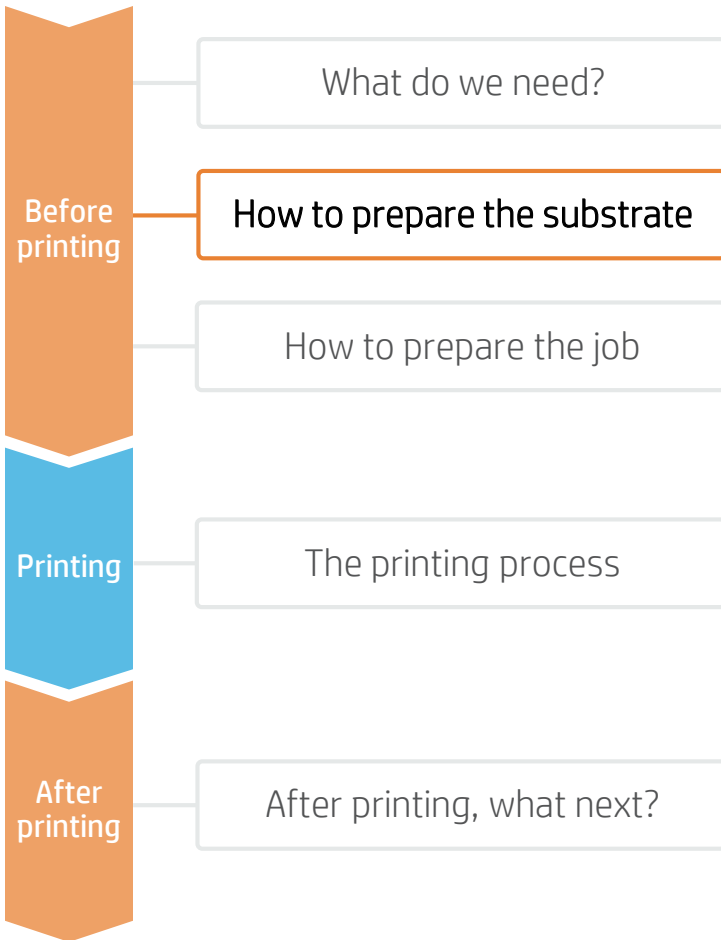
Tools for bending or thermoforming (optional)



Drill and drill bits for use with metal (optional)

# How to print on acrylic boards

## How to prepare the substrate



### 1. Ensure panel flatness

Acrylic boards tend to absorb some moisture and lose their flatness. Ensure the board is flat before printing.

**NOTE:** If the panel is deformed there is a risk of printhead crash. The use of edge holders may be necessary when printing on waved substrates.



### 2. Substrate handling

Handle samples with care! Gloves are recommended to prevent accidental cuts and also to avoid leaving fingerprints on the surface. Marks and scratches created prior to printing will be visible when the job is printed.



### 3. Cutting

Cut the sample to the desired size using a suitable device (e.g., table saw, cutting table).

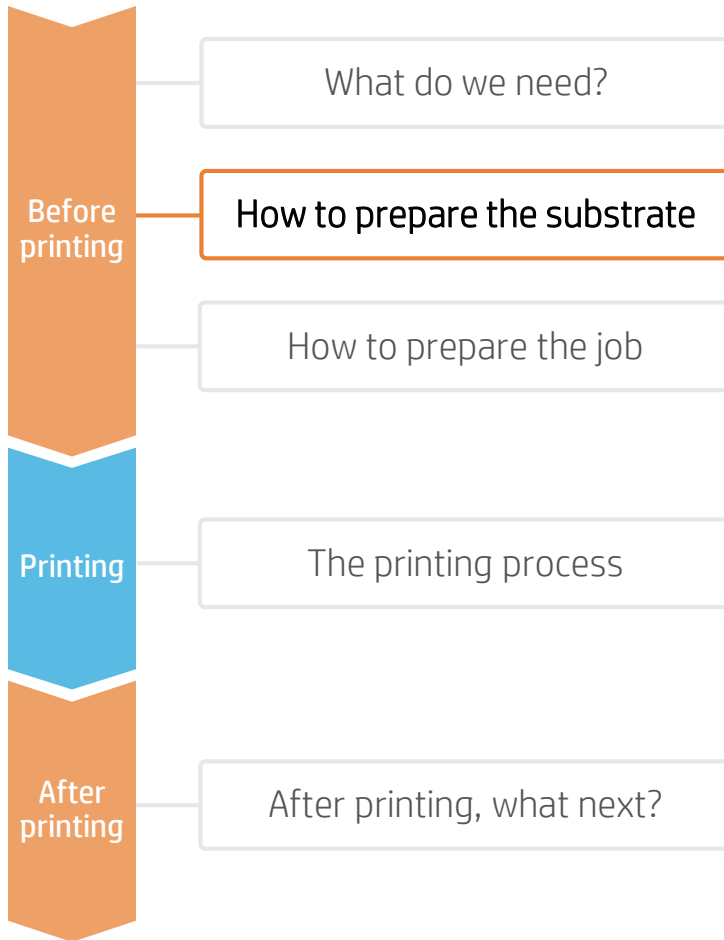
**NOTE:** This process can also be done after the job is printed. There is no ink chipping along the cut edge.



**TIP:** Thin boards (1 mm) can also be cut using a ruler or carpenter's square and a cutter.

# How to print on acrylic boards

## How to prepare the substrate



### 4. Remove the liner

If the substrate has a protective film, peel it off from one side, leaving the other side protected until finishing or installation of the finished graphic. Avoid touching the print surface with unprotected hands. Fingerprints may become visible after printing.



### 5. Cleaning

After the protective film has been removed, dust particles may tend to adhere to the print surface. Remove dust particles by wiping the surface with an anti-static cloth.

**TIP:** If an anti-static cloth is not available, use a 70% Isopropyl Alcohol / 30% water solution with a lint-free cloth and wipe the print surface. Let it dry before printing.



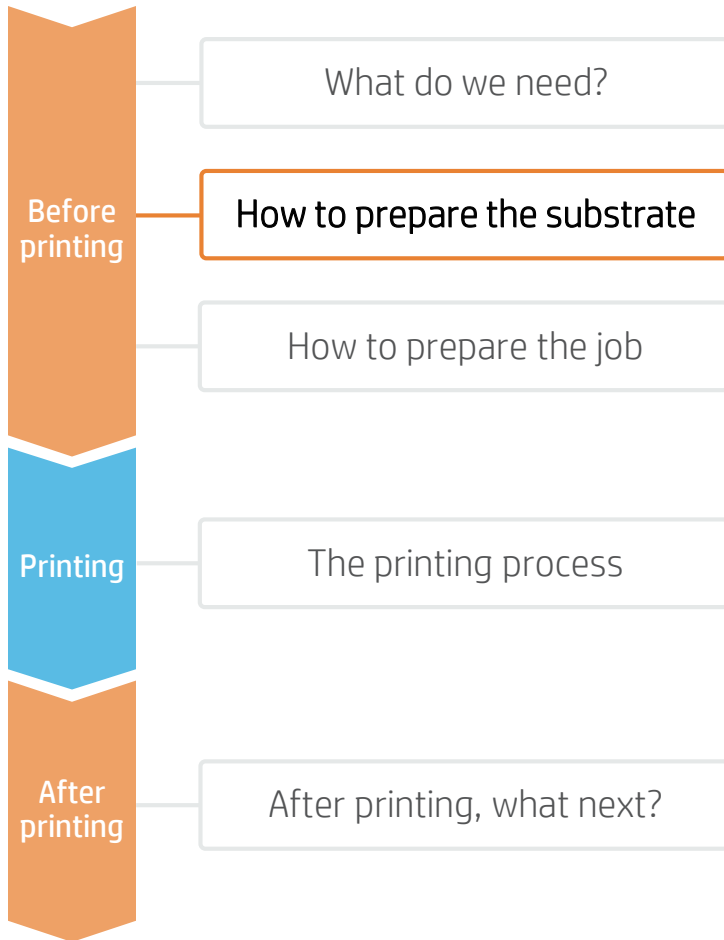
### 6. Substrate considerations

If extra durability or ink adhesion is required, an alternative acrylic with digital surface treatment can be used: **Plaskolite Optix DA** is an enhanced acrylic for digital printing. **Polycarbonates** may also be an alternative to acrylic substrates for most applications, especially if laser cutting is not required.



# How to print on acrylic boards

## How to prepare the substrate



### 7. Primer considerations

Acrylics tend to have inferior scratch resistance and ink adhesion compared to other plastics. If extra durability is required, a primer can be applied prior to printing. This process is **optional** and may greatly depend on the substrate being used. Primer application is described in the following general instructions.

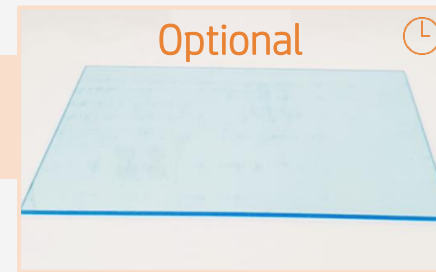
**TIP:** HP recommends application of primer to the whole surface in order to avoid visual differences. Manual application is recommended for small or medium size panels (A3/A2 sizes).



#### 7.1 Primer application

Apply the primer uniformly from edge to edge to avoid marks or lines.

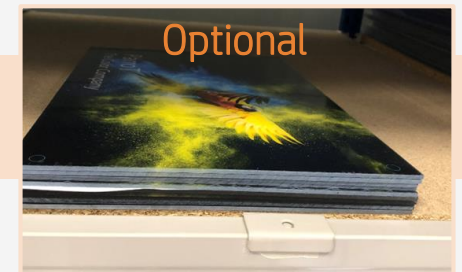
**TIP:** HP recommends application of primer to the whole surface in order to avoid visual differences. Manual application is recommended for small or medium size panels (A3/A2 sizes).



#### 7.2 Primer drying

Allow the primer to **dry for 30–60 min** prior to printing. HP recommends printing within the following **4–5 hours**. Follow the instructions provided by the primer manufacturer.

**NOTE:** Ink and primer adhesion depends on the surface chemistry and its interactions. We recommend performing a compatibility test with ink and primer prior to applying it to a whole job.



#### 7.3 Primer durability

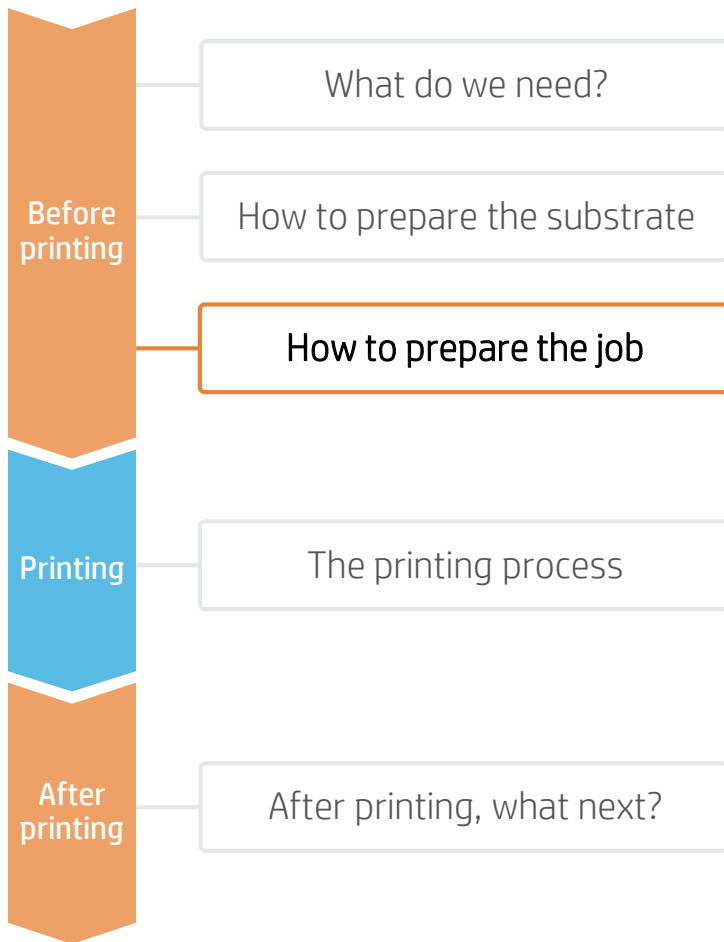
After printing, handle samples with care. Full ink durability is usually achieved after 24 h from printing.

**NOTE:** Spandex DGPA, a primer tested on Evonik Plexiglass XT and Evonik Plexiglass GS by HP, has shown increased durability.

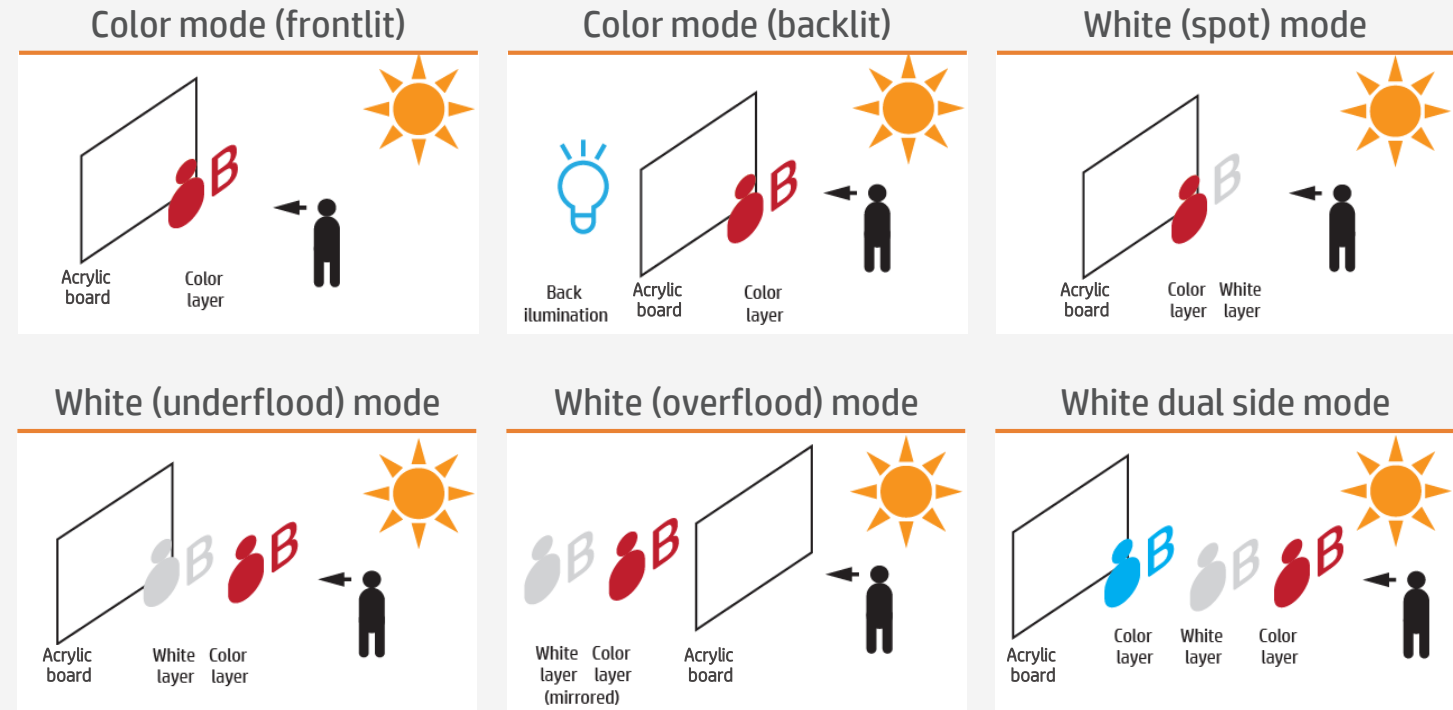
**HEALTH & SAFETY:** Protective gloves and goggles are recommended when applying primers (Check complete information in MSDS). A clean and well-ventilated room is required to apply most primers.

# How to print on acrylic boards

## How to prepare the job



Make your decision based on application and substrate needs:



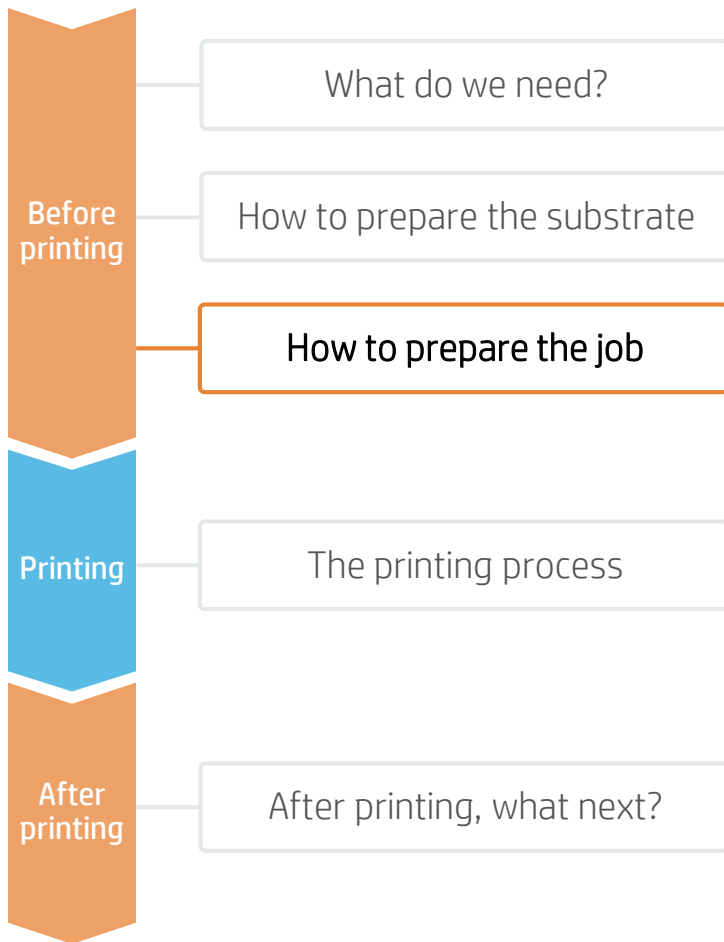
**NOTES:** There are generic and specific substrate presets that have been developed for backlit and frontlit acrylic applications:

- **Frontlit** presets are used to print on white opaque boards or on substrates that won't be placed on light boxes.
- **Backlit** presets are used to print on translucent (opal) or clear boards placed on light boxes. Ink load is increased vs frontlit.
- Presets with **White** ink (spot and underflood) are normally used on non-white and clear boards.
- Presets with **White** ink (overflow and dual side) are mostly used on clear boards.

→ To work with White, please, refer to the cookbook "How to print on White".

# How to print on acrylic boards

## How to prepare the job



## Plastic solid substrate presets

Many acrylic board substrates have been tested at HP. In some cases, a substrate preset has been created and is available for downloading. Visit: <https://www.printos.com/ml/#/homeMediaLocator>





- If the substrate you're using has an available substrate preset, we recommend downloading, installing, and using it on your printer and RIP.
- If there is no substrate preset for the specific substrate being used, using the "Generic Plastic Solid" or "Generic Backlit Plastic Solid" substrate preset may be a good starting point.

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### HP Media Solutions Locator

#### Exceptional media versatility

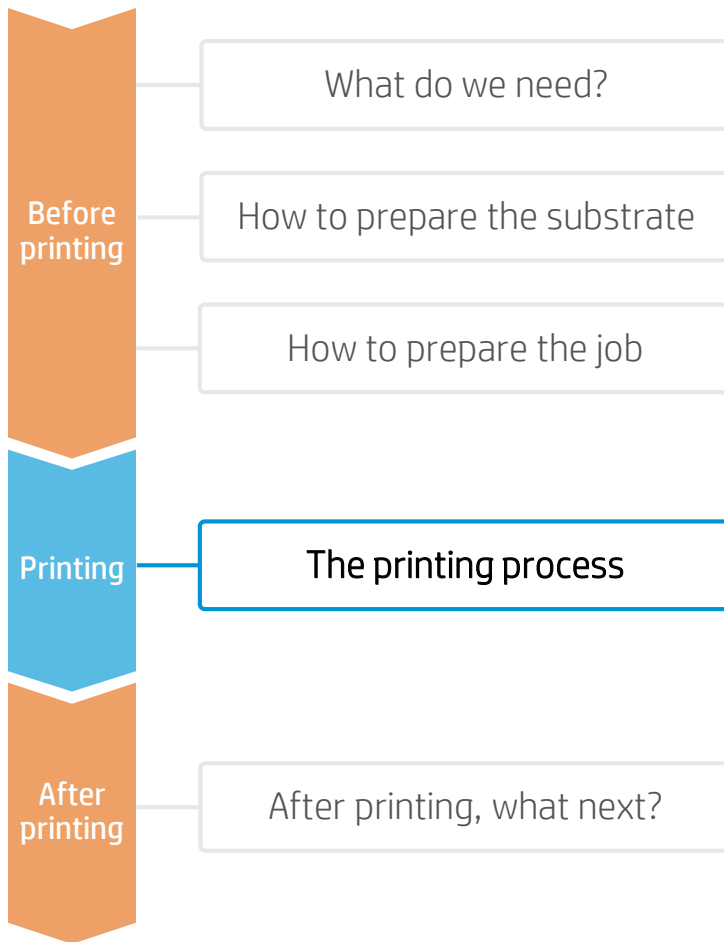
HP printers and presses are compatible with thousands of certified graphic arts media solutions.<sup>1</sup> Discover the options that best fit your business needs and create new revenue opportunities, using HP PrintOS.




HP DesignJet printers HP Latex printers HP Scitex presses

# How to print on acrylic boards

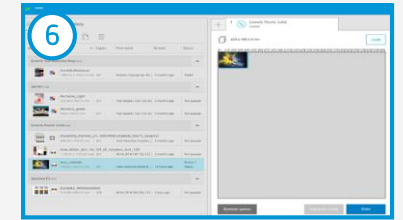
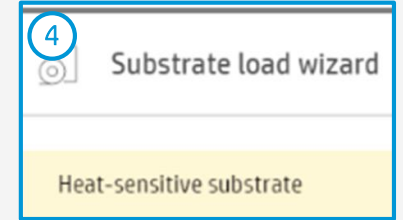
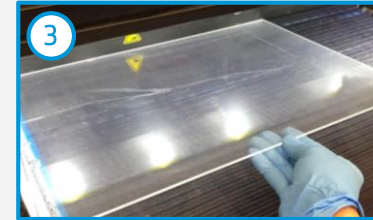
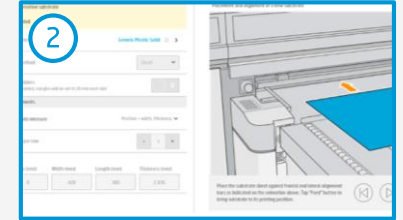
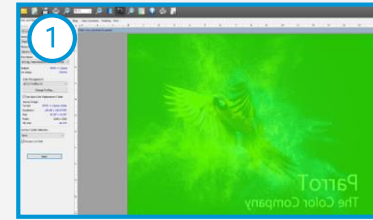
## The printing process




 **NOTE:** We recommend using substrate edge holders when printing on boards wider than 1500 mm/ 59", when printing on boards with a thickness of 3 mm or less, or when printing on waved boards.



1. RIP the artwork after selecting the corresponding substrate preset and print mode for the acrylic boards. Send the output to the printer's nest.
2. Load the substrate on the printer as *Generic Plastic Solid > Generic Backlit Plastic Solid* or using the specific preset previously downloaded.
3. Follow the loading process.
4. Select heat sensitive (HS) modes when printing on boards of 3 mm or thinner.
5. Activate the HS lever if needed.
6. Select the RIPped job and drag it to the printer queue.



 **NOTE:** Regarding the print mode selection:

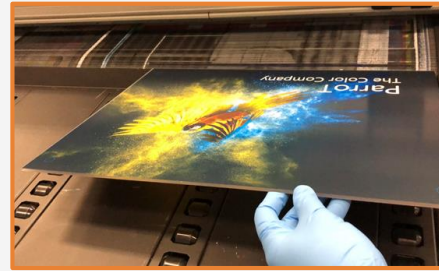
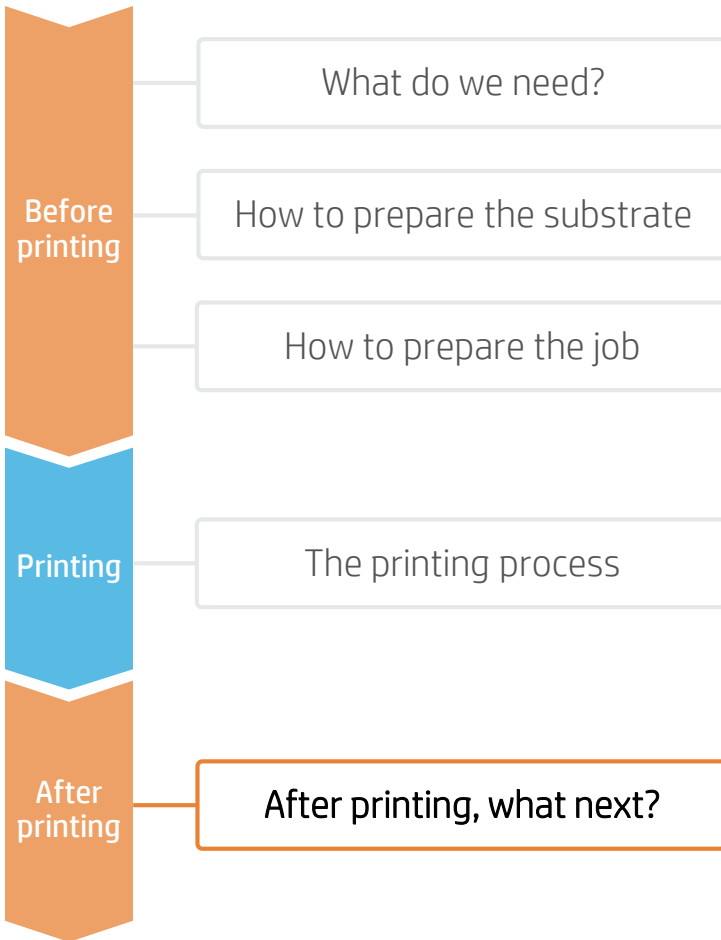
- Select **"High Quality"** mode to print images that do not require white.
- Select **"White OF"** modes on clear substrates when the print side is seen from the opposite side. In this mode, a color ink layer is printed first and then a white layer is printed on top of it.
- Select **"White UF"** modes on non-white acrylics when there is a need to get realistic colors. In this mode, a white ink layer is printed first and then a color layer is printed on top of it.
- Select **"Dual Side"** on clear substrates when two images need to be viewed from each side and white is required. In this mode a color layer is printed first, then a white, and finally a second color layer.





# How to print on acrylic boards

## After printing, what next?



### 1. Handling samples

HP recommends using gloves when handling samples immediately after printing, as the panel will be hot. Use caution when loading or lifting sheets from the tables, as the substrate and ink can be scratched.

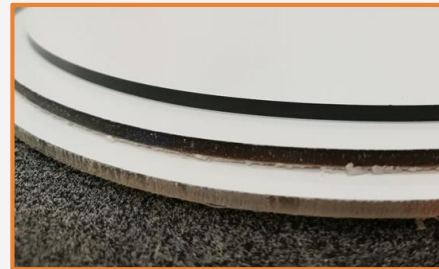
**NOTE:** Ink adhesion may improve over 24 hours. However, it is possible to handle, machine, and finish samples immediately after printing.



### 2. Cutting with a router

Cut the samples to the final dimensions if you have not done so previously.

**NOTE:** It is possible to successfully cut different panels on a Zünd XL3200 table cutter using the following settings: Head – Router module RM-A QC; Drill – R204 / R209 (4 mm); Cutting speed – 170 mm/s Max. Cutting depth per pass: 4 mm.



**NOTES:** It is possible to successfully cut different panels on a Summa F3220 table cutter using the following settings: Cutting tool: HF Router; Drill – 500-9854 (4 mm); Cutting speed – 50 mm/s Max. Cutting depth per pass: 3 mm.

- We recommend not cutting different materials with the same drill. Reserve drills to cut the same category of materials to get the most accurate cut.



### 3. Cutting with a laser

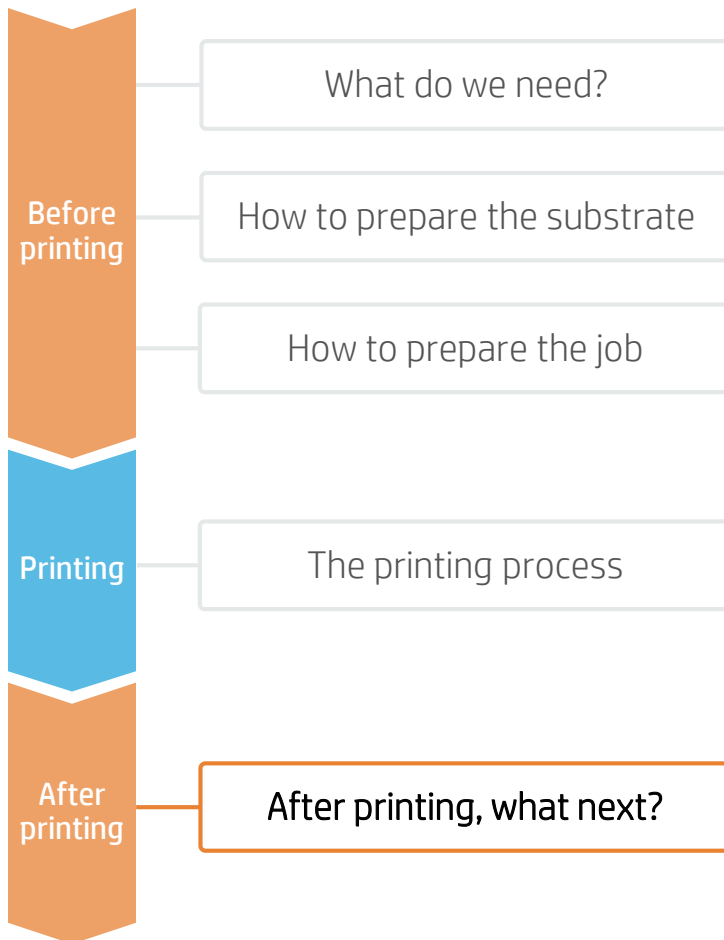
Samples printed with latex inks can be cut using laser cutters. This process produces a smooth edge finish.

**NOTE:** In some cases, a “shadow” image may appear close to the edge when cutting printed samples. HP recommends leaving an unprinted border when laser cutting is used.



# How to print on acrylic boards

## After printing, what next?



### 4. Finishing the cutting edge

If samples are not cut using a laser, there are different methods to finish the edge. Sanding, scraping, or flame polishing are possible finishing options. HP recommends avoiding the printed area when polishing the acrylic boards.



### 5. Substrate expansion

Acrylic boards expand and contract with temperature changes. When installing acrylic panels it's very important to consider substrate expansion to avoid cracking of the boards. Drill oversized holes to allow boards to absorb expansion.

Acrylic expands approx. 0.075 mm/m/K (0,000045in/in/F) , depending on the supplier.

**EXAMPLE:** A 1 meter sign is printed and cut in a sign shop where the temperature is 20°C. The sign will be placed outdoors. The maximum temperature we can expect after installation is 35°C and the minimum is 0°C.

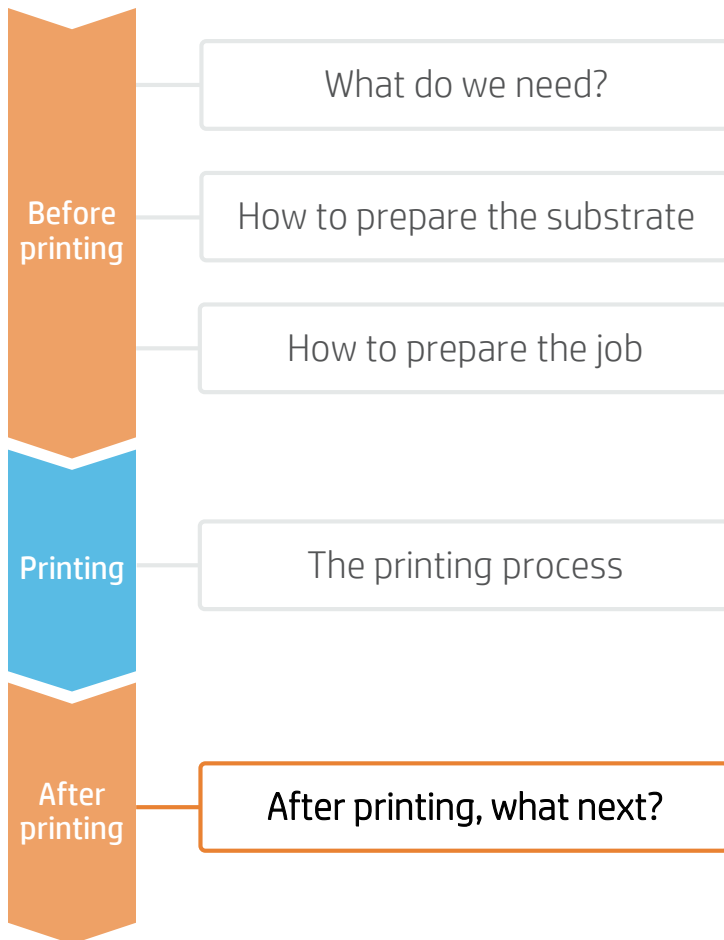
- Substrate expansion:  $0.075 \times \text{sign size(m)} \times (\text{Max expected temp} - \text{Temp at cut})$
- Substrate contraction:  $0.075 \times \text{sign size(m)} \times (\text{Temp at cut} - \text{Min expected temp})$
- Substrate expansion:  $0.075 \times 1 \times (35-20) = 1.13 \text{ mm}$
- Substrate contraction:  $0.075 \times 1 \times (20-0) = 1.5 \text{ mm}$

**EXAMPLE:** A 40" sign is printed and cut in a sign shop where the temperature is 68°F. The sign will be placed outdoors. The maximum temperature we can expect after installation is 95°F and the minimum is 32°F.

- Substrate expansion:  $0.000045 \times \text{sign size(in.)} \times (\text{Max expected temp} - \text{Temp at cut})$
- Substrate contraction:  $0.000045 \times \text{sign size(in.)} \times (\text{Temp at cut} - \text{Min expected temp})$
- Substrate expansion:  $0.000045 \times 40 \times (95-68) = 0.05 \text{ in}$
- Substrate contraction:  $0.000045 \times 40 \times (68-32) = 0.065 \text{ in}$

# How to print on acrylic boards

## After printing, what next?



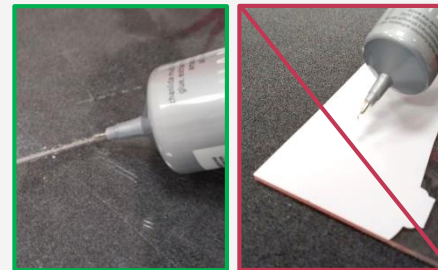
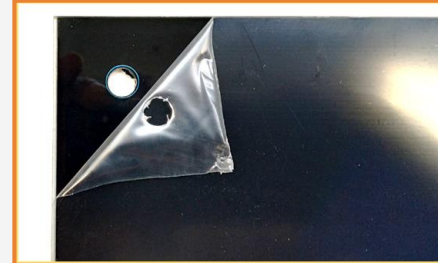
### 6. Drilling

HP recommends using the router to drill any necessary holes. For onsite installations, it is also possible to use a manual drill with a proper bit for plastics.

When mounting acrylic signs using standoffs or supports, keep in mind substrate expansion and hole positioning on the sign to avoid cracking of the acrylic.

#### NOTES:

- Acrylics will crack if they're drilled using a bit not designed for plastic or if the hole is near the board's edge. When drilling a hole we recommend: (1) Use HSS, cobalt, or HSS with carbide tips for plastic with a 60–90 degree tip angle. (2) The distance from the hole center to the edge of the sign should be at least **1.5 times** the diameter of the hole.
- As a very general rule the bolt hole diameter in the board should be at least **2 times** the diameter of the bolt.

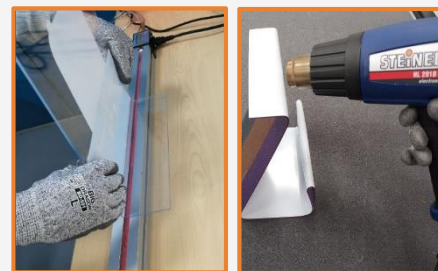


### 7. Gluing/Joining

Acrylic can be joined using cyanoacrylate, with heat, or by using solvents such as di- or trichloromethane to dissolve the plastic at the joint.

Avoid contact between the printed area and the glue or solvents as ink might be removed or damaged, or color change might be observed.

Follow the glue user guide to dry and cure the glue.



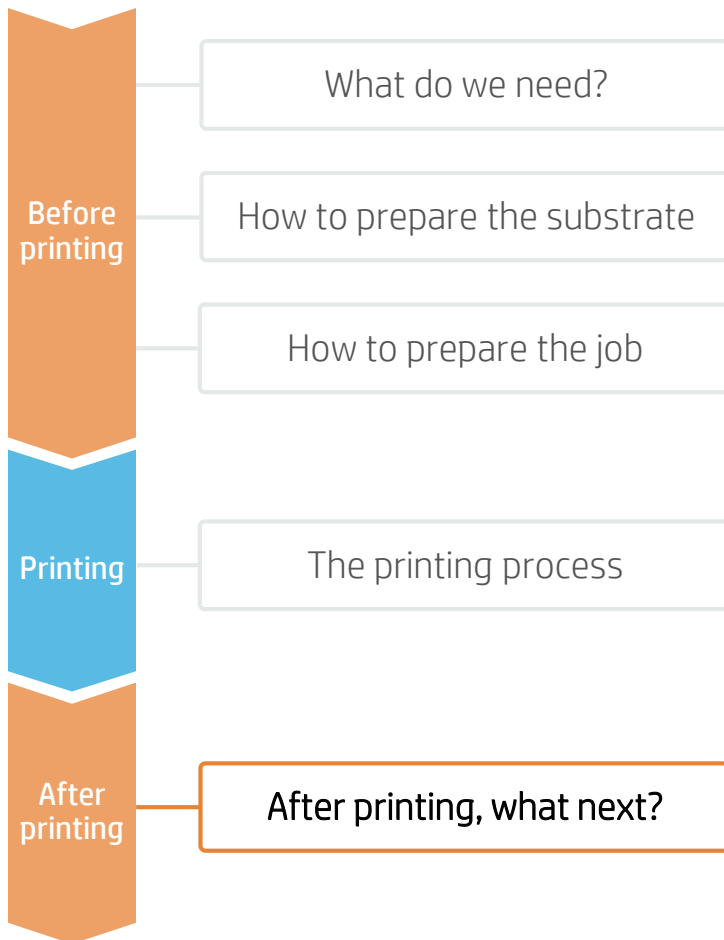
### 8. Hot Bending

Latex inks are very flexible and temperature resistant. Latex inks won't crack when using hot bending at large angles.

A heat gun or hot bending machine could be used. Heat the board at the intended position until the board is soft and bend it to the target angle.

# How to print on acrylic boards

## After printing, what next?



What do we need?

Before printing

How to prepare the substrate

How to prepare the job

Printing

The printing process

After printing


After printing, what next?



### 9. Thermoforming

Acrylic boards can be thermoformed. This process converts flat signs or displays into 3D shaped surfaces.

Different forming techniques such as bubble (free forming) or vacuum forming are compatible with latex inks due to their elasticity and heat resistance.

 **NOTE:** To learn more about thermoforming, refer to the cookbook “How to thermoform latex samples”.



### 10. Cleaning

We recommend cleaning acrylic with a soft dry cloth. If extra cleaning is needed we recommend cleaning with water and a clean soft cloth only.

Acrylics do not support the use of alcohol, benzine, or brushes to clean them.



## How to print on acrylic boards

Partnership:

Learn more at:

[www.hp.com/communities/lkc](http://www.hp.com/communities/lkc)

Partnership







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