
Material Best Practice Guide for Xtreme 8K™ & Pro XL™

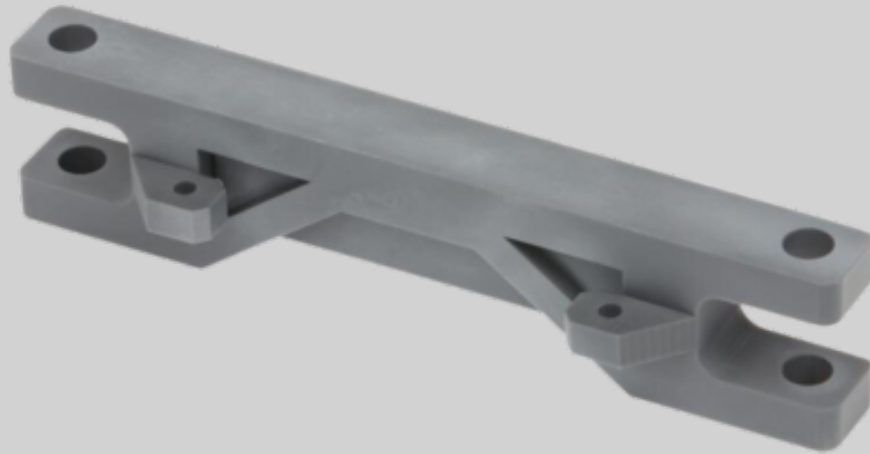


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History of Changes

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September 2023	Document creation	1.0
September 2023	<ul style="list-style-type: none">▪ Updated Title page▪ Updated Software	2.0
November 2023	<ul style="list-style-type: none">▪ Updated About Evonik INFINAM® ST 6100 L▪ Updated Getting Started▪ Updated Software▪ Updated Print Preparation▪ Updated Post-Processing	4.0

About This Guide

This document helps you prepare, post-process, and finish parts using Evonik INFINAM ST 6100 L material.

Evonik INFINAM ST 6100 L Material Best Practice Guide: 81-00260_R03, November 2023.

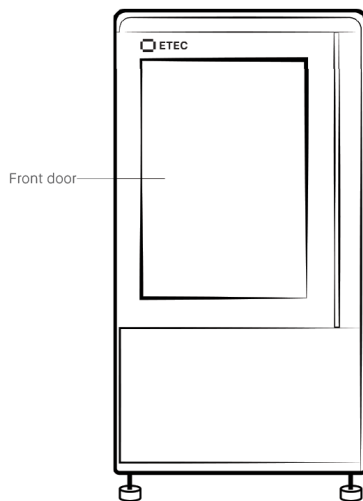
About Evonik INFINAM® ST 6100 L

Evonik INFINAM® ST 6100 L is a stiff, tough, heat-resistant material that can be printed in high resolution with excellent surface finish for end-use parts. The material is ideal for a variety of applications, including housings, manufacturing fixtures, electrical connectors, alignment jigs and more.

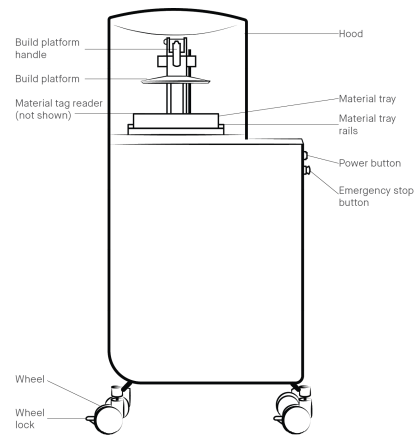
Applicable Printers

This material is tested and approved for the following printers:

- Xtreme 8K™
- Pro XL™



Xtreme 8K Front View



Pro XL Front View

Getting Started

Primary Supplies

Acquire primary supplies prior to product delivery. Obtain the proper tools to prepare for successful printing and post-processing.

The following supplies are required to print Evonik INFINAM ST 6100 L material:

- Evonik INFINAM ST 6100 L, Product Code: RES-01-7500 (1 kg), RES-99-1028 (10 kg) and RES-99-1029 (25 kg).
- Personal Protective Equipment (PPE).
- Material mixing:
 - Xtreme 8K: Silicone mixing blade attachment and industrial mixing drill.
 - Pro XL: Dual Motion Bottle Roller, Product Codes ACC-26-1000 (110V) and ACC-26-1000 (220V), and rubber spatula.
- Material filtering:
 - Xtreme 8K: 5-gallon bucket and paint strainer.
 - Pro XL: Cone-shaped paint filter and spare material storage bottle.
- Part removal:
 - Xtreme 8K: Razor scraper.
 - Pro XL: Paint scraper.
- Washing unit options:
 - Small parts: PWA 2000, Product Code ACC-22-2000.
 - Medium and large parts: Desktop Orbital Shaker Washer, Product Code ACC-02-6000.
- Washing agent: 99% Isopropyl alcohol (IPA).
- Spray bottle.
- Air compressor.
- Curing unit options:
 - PCA 4000: Product Code ACC-06-1000.
 - Xtreme 8K only: UVCA 3000, Product Code ACC-02-1001.
- Drying oven: Programmable thermal oven up to 120° C, such as Desktop Metal's Shop System Drying Oven, Product Code SHP-PC0001.



Note: See [Xtreme 8K Site Prep Guide](#) and [Pro XL Site Prep Guide](#) for more information.

Design Parts Evonik INFINAM ST 6100 L

All parts printed in Evonik ST 6100 L must be printed on supports. Keep this in mind when designing parts for Evonik ST 6100 L.

Part warpage can occur during printing, UV curing and thermal treatment. Modify your design to account for print dynamics such as part warpage in order to achieve the highest accuracy. Make adjustments based on part measurements after all post processing steps have been completed.

- **Print Cure Stress:** Orient the part to minimize surface area per layer and to reduce the cure stress/warpage in parts. Parts with thicknesses over 5.0 mm and parts with straight continuous surfaces over 100.0 mm should follow the part orientation guidelines. See [Orient Parts](#).
- **UV Cure Stress:** Parts warp towards the light source during the post-curing process. Flip parts to reduce warping.



Note: Flipping parts yields the best result for parts with even geometries.

- **Thermal treatment stress:** Thermal treatment in the drying oven causes negligent warpage compared to print and UV cure stresses.



Tip: Parts can chip/fracture. Handle printed parts with care.

Add channels or drainage holes to hollow parts. This allows uncured material to drain from the hollow feature during the printing process.

Minimum Feature Size

Minimum feature size is dependent on:

- Printer
- Material
- Feature geometry

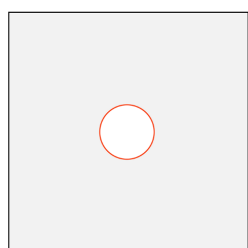
All design features include recommendations for absolute minimum feature size and recommended minimum feature size. Absolute minimums are the smallest resolvable feature size based on printability. Recommended minimums are provided to minimize potential warpage and account for part fragility. Part feature dimensions that are lower than the recommended minimum can fracture with minimal force.



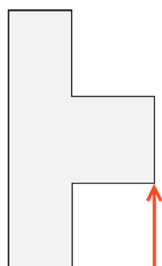
Note: Absolute minimum feature sizes are only valid for smaller features within the part geometry (text, small channels, etc.). They should not be used for the main components of design methodology.

ETEC recommends the following minimum feature sizes for parts printed in Evonik ST 6100 L:

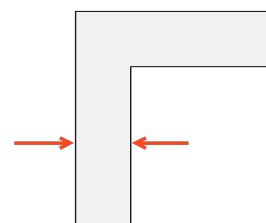
Design Feature	Xtreme 8K Absolute Minimum	Xtreme 8K Recommended Minimum	Pro XL Absolute Minimum	Pro XL Recommended Minimum
Wall Thickness	0.45 mm	2.0 mm	0.30 mm	0.50 mm
Cylinder Wall Thickness	1.0 mm	2.0 mm	0.45 mm	0.60 mm
Wire Thickness	1.0 mm	2.0 mm	0.45 mm	0.60 mm
Engraving Depth	0.15 mm	0.30 mm	0.10 mm	0.50 mm
Embossing Height	0.15 mm	0.30 mm	0.10 mm	0.30 mm
Positive Features	0.45 mm	0.60 mm	0.30 mm	0.45 mm
Negative Features	0.45 mm	0.75 mm	0.30 mm	0.60 mm
Font Size (Regular or Bold Font)	3.25 mm	4.25 mm	1.0 mm	1.50 mm
Text Depth	0.6 mm	1.05 mm	0.30 mm	0.50 mm
Text Height	0.3 mm	0.75 mm	0.30 mm	0.50 mm
Hole Diameter	0.45 mm	0.95 mm	0.45 mm	0.75 mm
Minimum Spacing	1.0 mm	2.0 mm	2.0 mm	2.0 mm
Bridge Gap Note: The value is maximum, not minimum.	4.0 mm	2.50 mm	3.50 mm	2.50 mm
Unsupported Horizontal Overhang Note: The value is maximum, not minimum.	1.0 mm	1.0 mm	1.0 mm	1.0 mm



Hole diameter



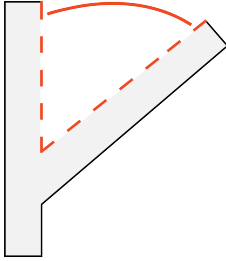
Unsupported horizontal overhang



Minimum wall thickness

Self-Supporting Angle

The absolute maximum self-supporting angle for parts printed with Evonik ST 6100 L is 70° from vertical (perpendicular to the build platform).



Self-supporting angle from vertical

The recommended maximum self-supporting angle on the Xtreme 8K is 60° from vertical. This means that parts at 60° or smaller angles may be printed without supports, but some deformation can occur.

The recommended maximum self-supporting angle on the Pro XL is 55° from vertical. This means that parts at 55° or smaller angles may be printed without supports, but some deformation can occur.

Software

Orient Parts Envision One RP Software

Envision One RP Software automatically orients your model, adds supports, if necessary, and sends the file to the printer, resulting in your three-dimensional model. Everything that is printed using ETEC printers must pass through this software successfully.

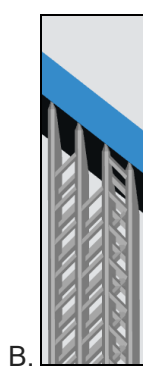
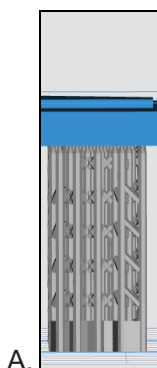
	Xtreme 8K	Pro XL
Spacing	Place parts a minimum of 1.75 mm apart.	Place parts between 2.0 and 5.0 mm apart.
Level at build platform	Place supported parts 30.0 mm from the build platform.	Place supported parts 4.0 mm from the build platform.
Resolution	100 μm Z resolution (dependent on layer thickness).	100 μm Z resolution (dependent on layer thickness).



Tip: Parts greater than 5.0 mm thick, and parts with straight continuous surfaces over 100 mm, must be oriented specifically and supported on as much of the face as possible to reduce cure stressing. Parts less than 5.0 mm thick and with reasonable lengths and widths have higher freedoms of part orientation and supporting.



Tip: Supports are easier to remove when their main axis is oriented perpendicular (90°) to the surface of the part. As this angle is reduced, it becomes more difficult to remove the supports.



Two examples of a part supported in Envision One RP. The supports on example A are perpendicular to the part, which improves the support removal and finishing processes. The supports on example B are more parallel to the part, which makes support removal and finishing more difficult

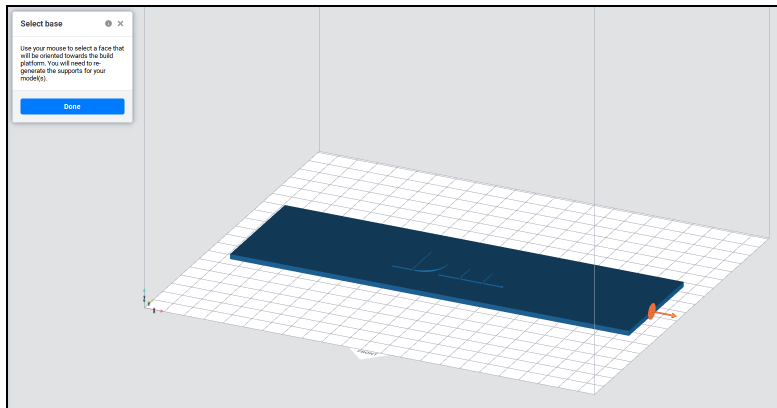
Support Parts Envision One RP Software

All approved applications require supports.



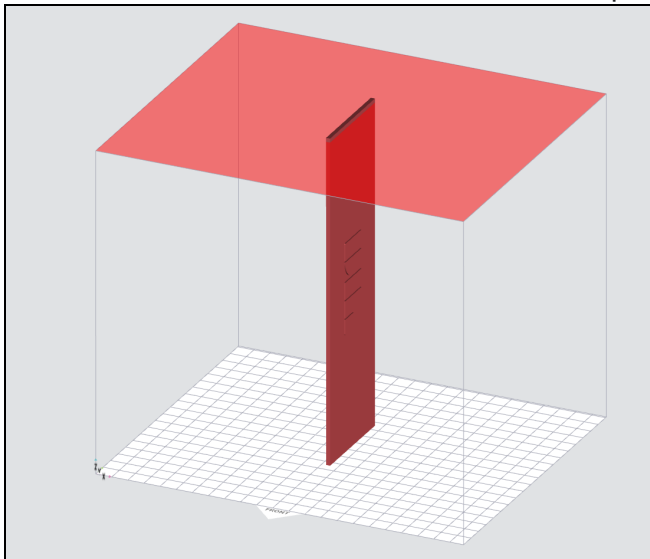
Important: Do not print parts flat-to-plate in Evonik ST 6100 L. All parts must use supports.

1. Identify the smallest face on the bounding box of your part.



Step 1: Sample part with the smallest face selected

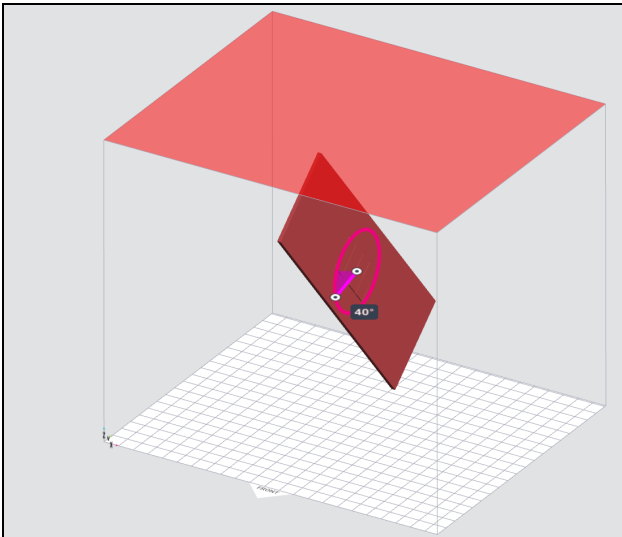
2. Use **Select Base** to orient the smallest face flat/parallel to the build platform.



Step 2: Sample part with the smallest face flat/parallel to the build platform

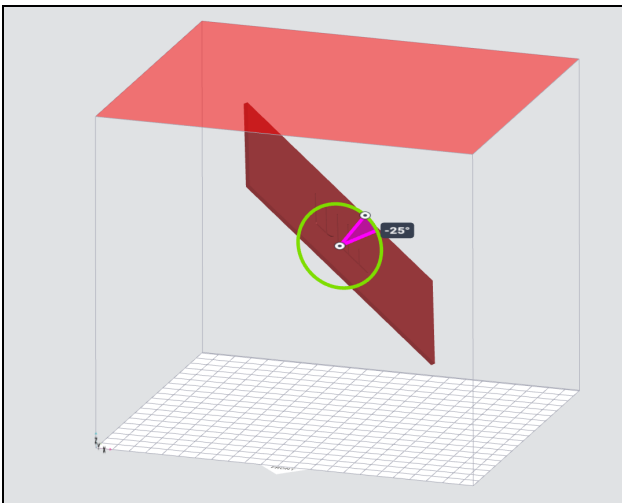
- a. If the smallest face is within 100 mm of continuous surface or if the part has a non-continuous surface, then move to **Step 3**.
- b. If the smallest face exceeds 100 mm of continuous surface or if part exceeds the allowed build height, then rotate the part around the smallest face's shortest edge until the starting layers (the

first 25%) are under 100 mm of continuous surface or within the build height.



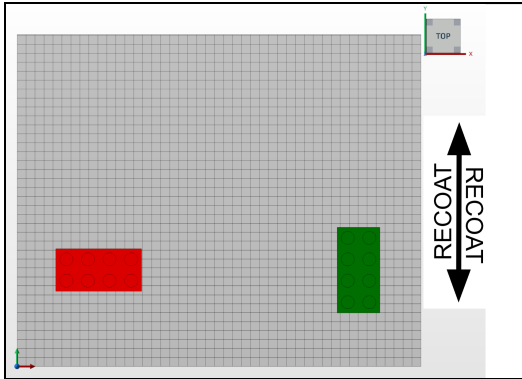
Step 2b: Rotate part around the smallest face's shortest edge

- c. If the part still does not fit within the allowable build height or if the first 25% of the layers exceed 100 mm of continuous surface, then cant/lean the part along the pivot point axis, respective to the horizontal plane.



Step 2c: Cant /lean the part along the pivot point axis, respective to the horizontal plane

3. **Xtreme 8K only:** Rotate the part along the Z axis until the broad side of the part is perpendicular to the recoater movement.



The same part placed in two orientations on the Xtreme 8K: the broad side of the left part does not face the movement of the recoater and is not recommended; the broad side of the right part faces the movement of the recoater and is best practice

4. Support the part with the recommended support settings and print. See [Support Settings](#).



Tip: It is recommended to support as much of the face of the part as possible to mitigate cure stressing in parts.



Tip: Limiting the angle a part is canted helps to limit cure stressing in parts.



Tip: Parts with thicknesses higher than 5.0 mm must be oriented specifically and supported on as much of the face as possible to reduce cure stressing. Parts with thicknesses lower than 5.0 mm and reasonable lengths and widths have higher freedoms of part orientation and supporting.

Support Settings

Support Setting Feature	Xtreme 8K Recommended Support Setting	Pro XL Recommended Support Setting
Minimum contact tip thickness	0.45 mm	0.60 mm
Minimum support beam thickness	1.30 mm	1.30 mm
Minimum support beam height	30.0 mm	6.0 mm
Minimum space between supports	1.75 mm	1.750 mm
Minimum support base	1.30 mm	1.20 mm
Clearance from part	2.0 mm	2.0 mm
Only from platform	Yes	Yes
Reinforcement spacing	5.0 mm	5.0 mm
Maximum angle	70°	60°
Maximum height	399.0 mm	160.0 mm
Base type	Baseplate	Baseplate

Print Preparation

Mix Material

Evonik ST 6100 L separates easily and must be mixed regularly.



Important: Parts printed on the Xtreme 8K and the Pro XL have different mixing recommendations. Use the mixing recommendations for the printer in use.

Xtreme 8K

1. Mix material in the material bucket with a silicone mixing blade attachment on a drill. Wait for bubbles to subside before filling the material vat.
2. Mix the material in the material vat for 3 minutes at a gentle speed with the silicone mixing blade attachment on a drill.
3. Repeat the mixing procedure twice a week, increasing frequency after 4 months of material usage in the material vat.

Pro XL

1. Mix the sealed material bottle on the bottle roller for 30 minutes.
2. Wait for bubbles to subside before filling the material tray.
3. Gently mix the material in the material tray for 1 minute with the rubber spatula.
4. Repeat the mixing procedure twice a week.

Fill Material Vat/Tray

Do not overfill the material vat/tray. Overfilling can cause the material to overflow at the start of the print job.



Important: Ensure there are no small, cured particles in the material. If found, then the material must be filtered. See [Maintain Materials Xtreme 8K](#) and [Maintain Materials Pro XL](#).

To add more material to the printer, carefully pour material into the material vat/tray between prints. See [Add Material Xtreme 8K](#) and [Add Material Pro XL](#).



Note: Do not add material to the material vat/tray during a print. Adding material while the print is paused, or during a print, will cause a small shift line in the part.

Print Evonik ST 6100 L

Before starting a print:

- Ensure the build platform is clean and free of cured material.



Xtreme 8K Tip: Imperceptible fragments of material may be left in the material vat/tray after part removal. Thoroughly examine the perforations in the build platform to remove any residual material left behind. If material fragments remain on the build platform, undesired platform movement may be seen during the recoater blade movement, or the recoater may encounter an obstruction and abort the print job.

- Ensure the material level is correct.



Xtreme 8K Note: If the material level is too low, a doming (downward curve) of layers will be seen. If the material level is too high, an upward curve of layers will be seen.

- **Xtreme 8K only:** Check the build platform level.
- **Xtreme 8K only:** Check the recoating blade gap.



Xtreme 8K Important: Ensure the material level, platform level and blade level is set correctly before starting the print. Evonik ST 6100 L is highly sensitive to misalignment in printer hardware and incorrect settings will lead to part defects.

To start and complete the print, see [Xtreme 8K Operations & Maintenance Guide](#) and [Pro XL Operations & Maintenance Guide](#).



Xtreme 8K Tip: Allow excess material to drip off before parts are removed from the build platform. To remove parts, place a paint or razor scraper into a perforation on the build platform, under a support beam. Pry upward gently. Repeat while moving around the part until the part pries off the platform. For large prints, remove the build platform with parts still attached for easier part removal. If part removal is difficult, then ensure that the material level has been set correctly. Part removal increases in difficulty if the material level is low.



Tip: Supports are sharp, use caution during removal. Gently pressing on the supports in the middle of the beams for easier support removal.

Post-Processing

Materials Safety

The **Safety Data Sheet (SDS)** for materials used in the printing process are available from ETEC or directly from suppliers. Read and understand the information provided in these documents prior to attempting to operate the printer or handle any media.

WARNING

Fire hazard: Some materials used for washing may be flammable. Do not wash parts in proximity of any potential ignition source. Washing or drying equipment must be approved for use with flammable solvents. Read SDS and contact your EHS Representative.

Clean Printed Parts

Clean parts using one of the following cleaning options:

- **Small parts:** PWA 2000.
- **Medium and large parts:** Desktop Orbital Shaker Washer.



Important: Do not expose Evonik INFINAM ST 6100 L to the cleaning agent for longer than five minutes. Excess exposure to alcohol may cause erosion on the surface of the part, and the surface can turn white with prolonged exposure.



Tip: Parts scuff easily when in contact with other parts or equipment. Take care in part handling and avoid overcrowding during the washing cycle.



Note: Do not use abrasive materials to clean parts. Due to the material's low viscosity, manual cleaning should not be needed.

Clean parts with the PWA 2000:

1. Remove excess resin from the parts using compressed air.
2. Wash the parts in the PWA 2000 with 99% IPA for three minutes on **High**.
3. Remove the parts as soon as the program is done and dry with compressed air for 20 to 40 seconds.
4. If the surface of the parts is glossy after drying, spray with IPA and remove residue with compressed air. The surface should be matte and smooth.

Clean parts with the Desktop Orbital Shaker Washer:

1. Remove excess resin from the parts using compressed air.
2. Wash the parts in the Orbital Shaker with 99% IPA for three minutes at 100 RPM.
3. Remove the parts as soon as the program is done and dry with compressed air for 20 to 40 seconds.
4. If the surface of the parts is glossy after drying, spray with 99% IPA and remove all residue with compressed air. The surface should be matte and smooth.



Note: A new washing solution for large parts is in development.

Dry Parts

Parts must be completely dry before post curing.

1. Dry the parts with compressed air.
2. Place the parts in a dark room on a clean surface lined with parchment paper.
3. Leave the parts to dry for 30 minutes.

Post Cure Printed Parts



Important: Orient parts to minimize part warpage during thermal treatment. UV curing can impart cure stresses to the parts, and the parts can flex towards the light source. Take UV curing into account for cure stresses and for correcting dimensional deviations.

Post cure parts using one of the following curing options:

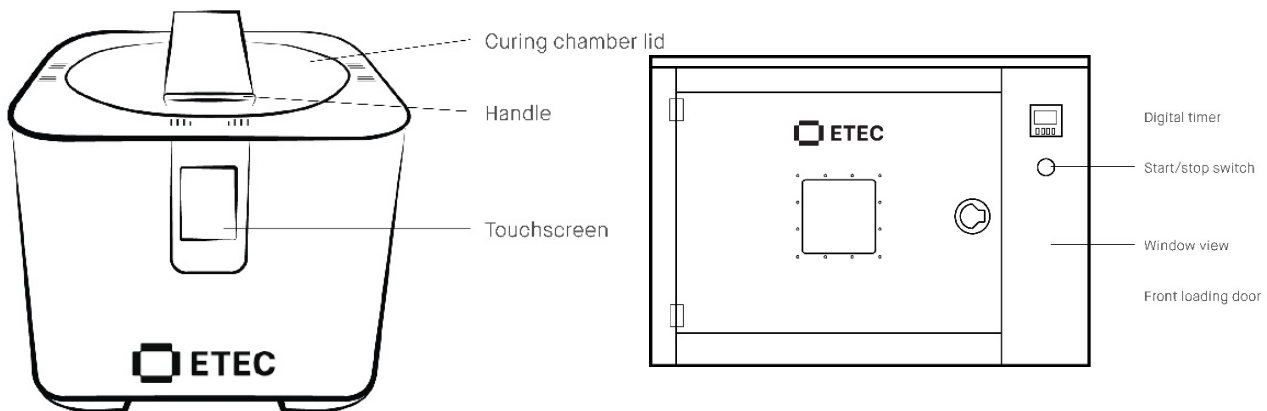
- PCA 4000. See [Programs and Features PCA 4000](#).
- Xtreme 8K only: UVCA 3000. See [Hardware Operations UVCA 3000](#).

Cure parts with the PCA 4000:

1. Place parts in the curing unit with as much space between parts as possible. Parts should never touch one another while curing.
2. Cure the parts in the PCA 4000 for 60 minutes at 20° C (Xtreme 8K)/60° C (Pro XL) and 100% power.
3. When the cycle ends, let the parts cool completely before handling.
4. Flip the parts between cycles for an even cure.
5. Repeat **Steps 2-3**.

Cure parts with the UVCA 3000:

1. Place parts in the curing unit with as much space between parts as possible. Parts should never touch one another while curing.
2. Cure the parts in the UVCA 3000 for 80 minutes at 20° C and 100% power.
3. When the cycle ends, let the parts cool completely before handling.
4. Flip the parts between cycles for an even cure.
5. Repeat **Steps 2-3**.



PCA 4000 Front View

UVCA 3000 Front View

Thermal Treatment

Thermal treatment of parts is required for all part applications, with or without HDT. The Shop System Drying Oven from Desktop Metal is recommended for thermal treatment. See [Desktop Metal's Shop System Drying Oven](#).



Important: Thermal treatment is required for all applications.

1. Preheat the oven based on the required part application:
 - a. **For applications that do not require HDT (0.455 MPa) of 120° C:** Preheat the oven to 80° C.
 - b. **For applications that require HDT (0.455 MPa) of 120° C:** Preheat the oven to 110° C.
2. Once the required temperature is reached, place the parts in the oven for two hours.
3. Remove the parts from the oven. Allow the parts to cool completely before use.

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