

envisionTEC

Technical Guide

Lost Wax Investment Casting

This technical guide should serve as a reference for casting EnvisionTEC's castable materials via the lost wax casting method. The castable materials in this guide are: EC500, WIC100G, Easy Cast 2.0, PIC100, PIC100 G, EPIC, and EC3000.

Applicable Printers: All EnvisionTEC DLP and cDLM printer series

Getting Started

This technical guide is designed to assist with successfully casting EnvisionTEC's castable materials. Lost wax casting includes many variables that must be handled precisely in order to achieve consistent results. Modifications to the burnout procedures in this guide may be necessary due to a variety of factors, such as size of flask, humidity level, and type of kiln used. These modifications are recommended throughout the guide.

Drying

For parts printed in a castable material, a drying process is needed to eliminate all IPA residue before post curing -

Dry in a convection oven at 100° F / 37° C for a minimum of 30 min and a maximum of 60 min, depending on volume of parts

A commercial grade low temp convection oven is recommended for this drying procedure. Cabela's **80-Liter Commercial Food Dehydrator** is recommended.

Casting Trees

When constructing casting trees, increase the connection between sprues by 10-30% of the sprue diameter. We recommend the sprues be tapered to help with metal flow during casting. Round, smooth, and thick transitions will reduce turbulence and increase the speed of the molten metal throughout the sprue system and into the pattern of the investment.

When considering sprue placement on the models, treat your models printed in EnvisionTEC's castable materials just as you would your hand carved wax models. Some models may require more sprues to help vent the material during casting. It is recommended that you add more sprues to large or thick pieces to accommodate for this.

Adhere wax sprues to the models in the following manner -

- 1 Sand the model roughly at the connection point.
- 2 Use beeswax or super glue to adhere the wax sprue to the model. Beeswax must be very hot to create the best possible connection.

For best results, make sure your vent point is large enough to allow flow of material out of the flask. **It is suggested to use a thicker base when working with polymers verses wax for the burn out.**

Investment

When casting platinum, we recommend **R&R Plasticast PT** investment. For all other metals, we recommend **R&R Plasticast** investment. Follow the manufacturers instructions for investing procedures.

Give the flask a maximum of four hours to bench set.

Firing

Gas kilns are recommended for all EnvisionTEC castable materials. Casting results may vary based on the specific kiln and/or ambient factors.

This technical guide is for casting with a **3.5 inch flask diameter, 800 feet above sea level**. If casting with a flask larger than 3.5 inches, add one hour of hold time to the burn out for each inch.

Ventilation is a key factor when processing investments in a kiln. The airflow fuels the machine and can optimize a burn out. **Propping flasks from the bottom with pieces of fire brick or a steel bolt** will introduce more airflow around the flasks and give the burn out an even heat treatment.

Troubleshooting

The lost wax casting process has many variables that contribute to a successful casting. If you experience issues with breakout or porosity during casting, reference this section to ensure you are following all recommended procedures.

- 1 When working with **lettering or relief work**, these surface details can sometimes fill in during the casting process. To remedy this, the printed models can be coated in **Procad Barrier Liquid for Resin Casting** after post curing and before spruing. This product is only recommended when casting silver or gold with WIC100G, PIC100, PIC100 G, PIC200, and Epic materials. *See the product manufacturer for more detailed instructions for use*
- 2 **Fillet all edges** slightly in your CAD software before printing the models. This is especially important for stone holes
- 3 **When working with engraving**, make sure the engraving is not deeper than it is wide
- 4 **Do not expose castable materials to 99% isopropyl alcohol for longer than 2 minutes** during post processing. Excess exposure to alcohol begins to degrade the models
- 5 **99% isopropyl alcohol must be removed from parts using compressed air**. Do not let models air dry with alcohol still on the surface
- 6 **Do not use less than 99% isopropyl alcohol** when post processing castable materials. Anything less than 99% will leave residue on the models
- 7 **Do not use an ultrasonic cleaner** to post process castable models
- 8 **Do not expose models to water** at any point during post processing
- 9 **Do not use a debubbler surfactant** that contains alcohol with EnvisionTEC castable materials. This product degrades the material
- 10 **Follow post curing instructions** for your specific post curing unit

Contact *EnvisionTEC technical support or an authorized distributor for more assistance.*



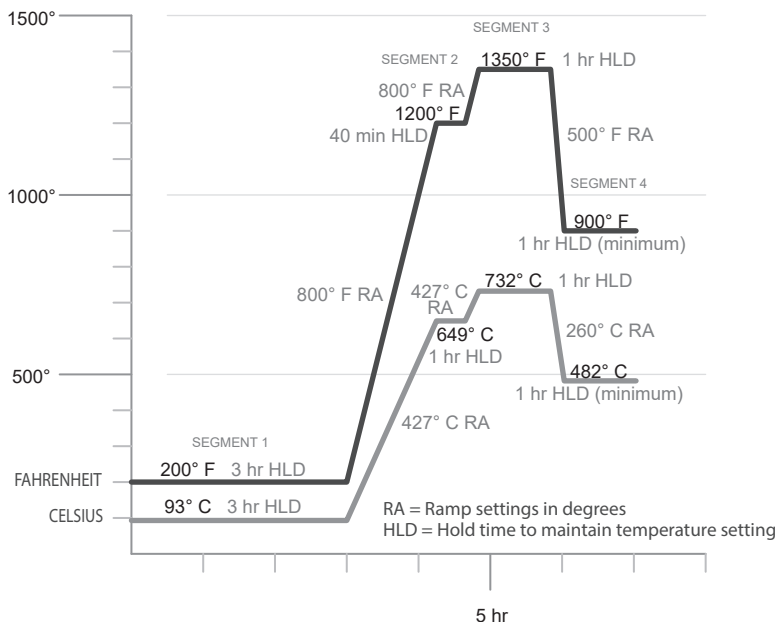
EC500 and WIC100G

EC500 and **WIC100G** have a shorter program than other castable materials. The higher wax content allows patterns to reach the desired ash content level at faster rates than the polymer-based **PIC** series. Casting results may vary depending on room temperature and relative humidity. The investment may need more time to divest based on these ambient factors.

Due to the high wax content, the optimal storage temperature for **EC500** and **WIC100G** is 73° F / 23° C. The minimum storage temperature is 65° F / 18° C, and the maximum storage temperature is 105° F / 40° C. Store the resin in an opaque bottle when not in use.

Preparation of the resin for the printing process involves warming the material in the bottle at a temperature of 105° F / 40° C for roughly forty-five minutes. Look to see if the material flows easily and is a uniform color with no texture. **Shake the bottle or use a bottle roller to mix.** This is especially important for **WIC100G**. Well mixed material will be a uniform color.

EC500 AND WIC100G FOUR SEGMENT FIRING PROGRAM



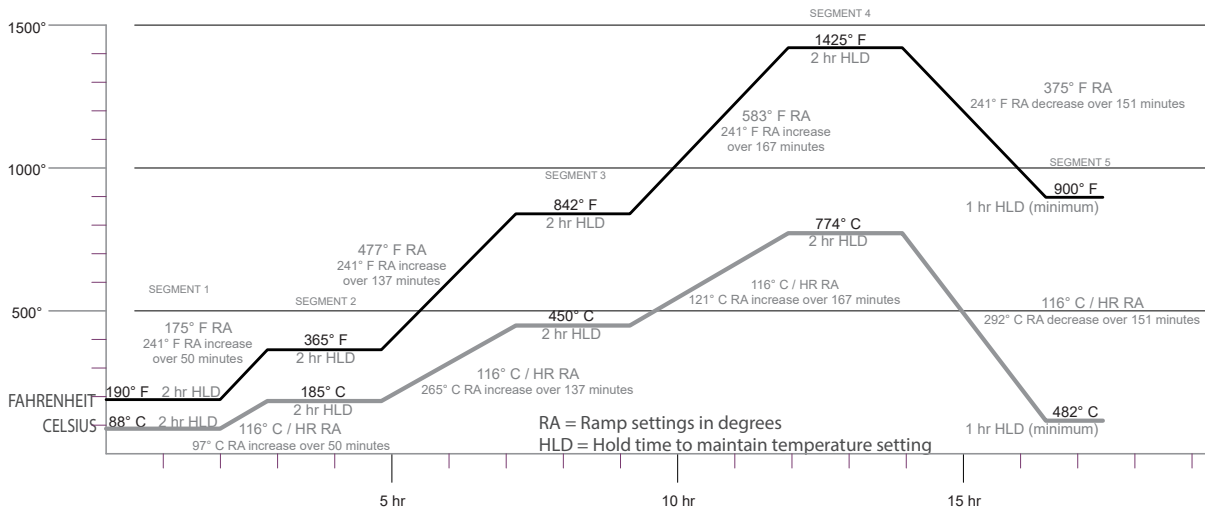
SEGMENT 4 can be extended and tailored to best suit the ambient casting factors. Only the minimum time needed for SEGMENT 4 was translated into the graph. SEGMENT 4 can be held between one and twelve hours. To help prevent porosity, slow down the initial ramp time for EnvisionTEC materials. The critical range is between 1-500 degrees F.

EASY CAST 2.0

Easy Cast 2.0 has the highest wax content of all of EnvisionTEC's materials, and was developed for printing exclusively on cDLM printers.

Due to the high wax content, the optimal storage temperature for **Easy Cast 2.0** is 73° F / 23° C. The minimum storage temperature is 65° F / 18° C, and the maximum storage temperature is 105° F / 40° C. Store resin in an opaque bottle when not in use.

EASY CAST 2.0 FIVE SEGMENT FIRING PROGRAM

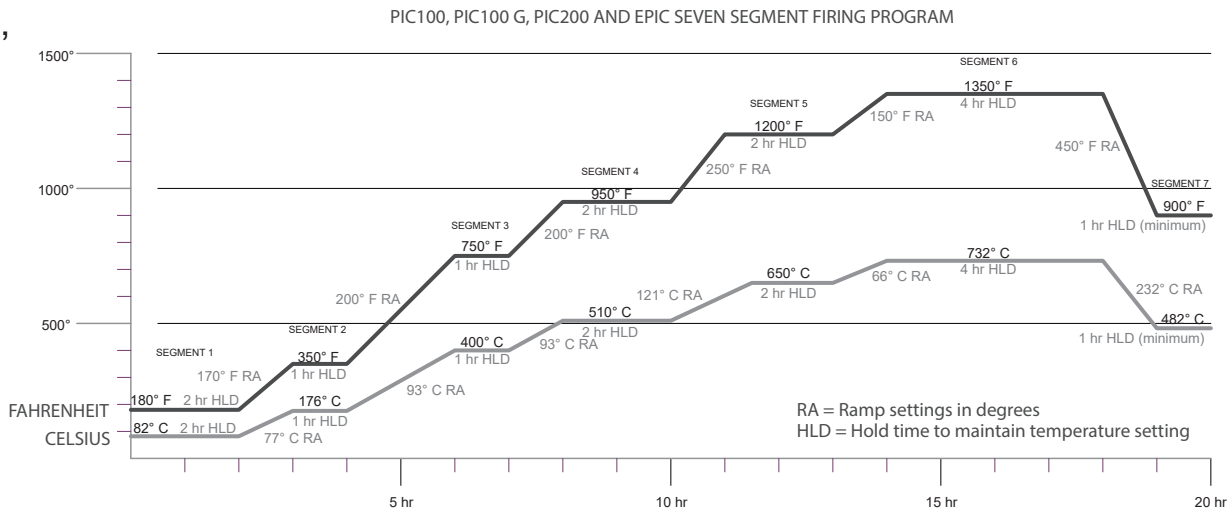


Preparation of the resin for printing involves warming the material in the bottle at a temperature of 105° F / 40° C for roughly forty-five minutes. Look to see if the material flows easily and is a uniform color with no texture. **Shake the bottle or use a bottle roller to mix.**

In SEGMENT 1, the 2 hour hold at 190° F / 88° C may be increased to 4 hours for great casting results. SEGMENT 5 may be held up to 12 hours depending on the ambient casting factors as well as the discretion of the caster based on the specific parameters of the burn out. **One hour is the minimum hold time.**

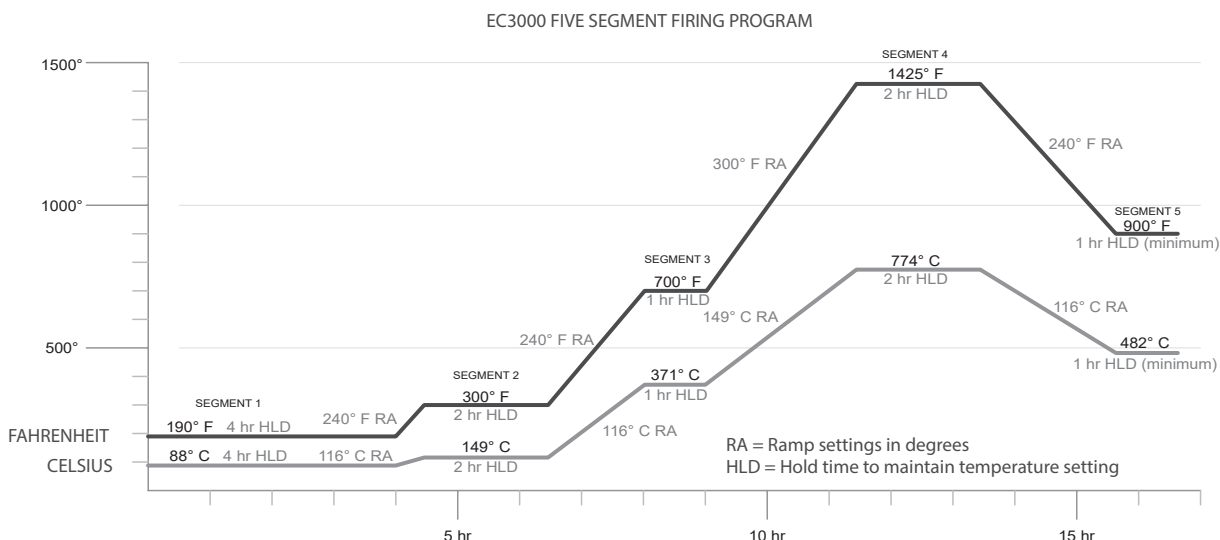
PIC100, PIC100 G, PIC200 and EPIC

PIC100, PIC100 G, PIC200 and EPIC are all polymer-based materials that make up the **PIC** series of castable materials. They require a slightly different burn out program to achieve a clean pattern divestment. The gradual ramp from **SEGMENT 1** to **SEGMENT 6** provides a clean transition from an invested pattern to a low-ash burn out.



EC3000

EC3000 is ideal for casting larger pieces, such as signet rings. Similar to **EC500**, **EC3000** has a higher wax content and a slightly shorter firing program than the more polymer-based **PIC** series. Due to the high wax content, the optimal storage temperature for **EC3000** is 73° F / 23° C. The minimum storage temperature is 65° F / 18° C, and the maximum storage temperature is 105° F / 40° C. Store the resin in an opaque bottle when not in use.



Preparation of the resin for printing involves warming the material in the bottle at a temperature of 105° F / 40° C for roughly forty-five minutes. Once warm, **shake the bottle or use a bottle roller to mix**. This is especially important for **EC3000**. Well mixed material will be a uniform color.

SEGMENT 5 may be held up to 12 hours depending on the ambient casting factors. **One hour is the minimum hold time.**

PLATINUM

Platinum requires higher temperatures to cast. This three segment firing program can be used to cast platinum in the following materials -

- PIC100, PIC100G, EPIC, EC500, WIC100G, and Easy Cast 2.0**

When casting platinum, **R&R Plasticast PT** investment must be used.

SEGMENT 3 can be extended and tailored to best suit the ambient casting factors, and the size of the flask used. Only the minimum time needed for SEGMENT 3 was translated into the graph.

