Lost Wax Investment Casting Technical Guide

A starting point to use as a reference for facilitating the lost wax casting method to create casted pieces using EnvisionTEC's castable resins: PIC100, PIC100 G, EPIC, EC500, Easy Cast 2.0 and EC3000.

Lost wax casting includes many variables that need to be handled precisely in order to achieve consistantly reliable results. This guide aims to aid in the beginning steps of creating a system that works within a casting equipped environment. Results may vary. Be prepared to make alterations to the provided formulas to for the best outcome possible. Practice caution and exhibit proper safety.

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Investment

Mix measured amounts of investment material, 39/100 **distilled** water to investment powder ratio, in a rubber mixing bowl. Using Plasticast:

- Mix quickly for four minutes. Use a blender for best results.
- Use a vacuum with a bell jar to extract the air from the mixture, shaking the platform as needed to agitate residual air bubbles to the surface.
- Slowly pour investment into flask.
- Tilt the flask and pour around the casting tree to protect the wax structure from breaking.
- Place investment flask into the vacuum to remove air bubbles, following the same process as before.

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

Casting Trees

To minimize turbulence, sprues need to be tapered to better host the flow during casting. Increasing the connection between sprues by 10-30% of the diameter of the sprue is a safe place to start when constructing casting trees. This transition will aid in the reduction of turbulence and increase the speed of the molten metal throughout the sprue system and into the pattern of the investment.

At times, a pattern needs to be fed bilaterally for a successful end product. In this instance, the primary feed sprue bisects to form the letter Y. The split channel needs to be open and smooth. It is encouraged to round the split in as a preventative measure against investment erosion which occurs when the molten metal washes against a sharp edge during the casting process, creating debris and premature cooling. Using a rectangular sprue will also help to give air a place to escape.

It is suggested to use a thicker base when working with polymers vs. wax for the burn in.

This guide is for a 3 1/2" flask, 800 ft above sea level.

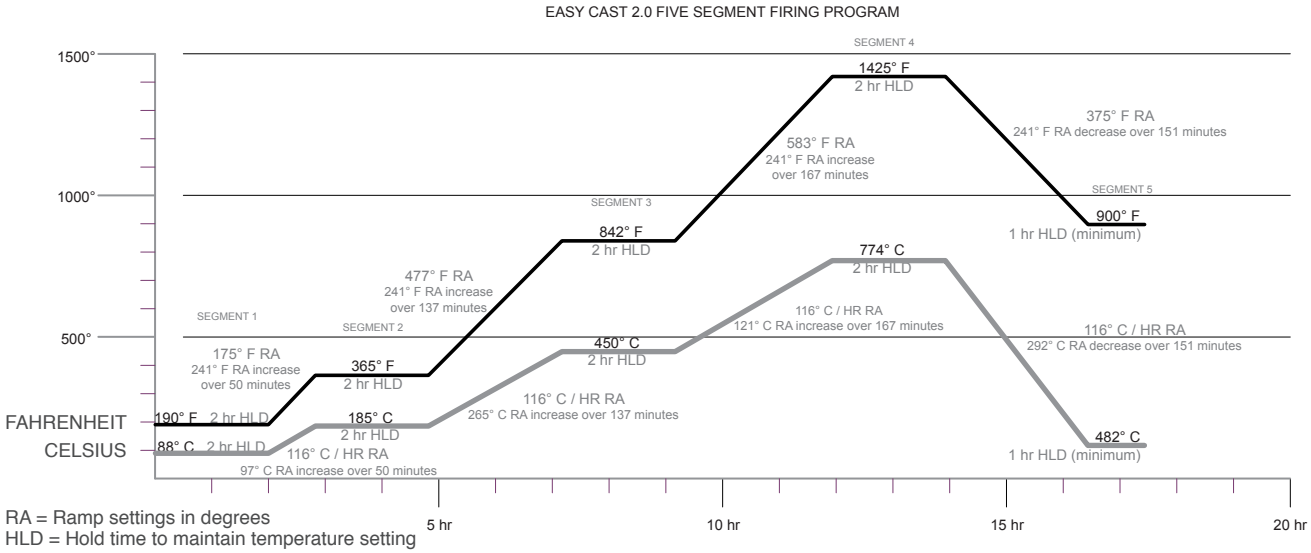
Firing

Follow all safety precautions while interacting with or near a kiln. Results may vary based on the specific kiln and/or ambient factors. Be sure to research before investing in a kiln so that the machine is equipped to handle it's destination environment/hook-ups, the amount of flasks it needs to accommodate, and if it is rated to meet the temperature guidelines needed to safely burn out the investments.

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 allow airflow to envelope the investment and give the burn out an even heat treatment.

A secondary option is to further induce a robust airflow by drilling a half inch or 12.7 mm **vent hole** in the middle of the kiln door to draw air in. Consider this option if pieces are casting with room for improvement. Improving airflow during the burn out program is an excellent place to begin to diagnose for a stronger end result.

Gas kilns work well with EnvisionTEC materials.



EC500 Burn Out

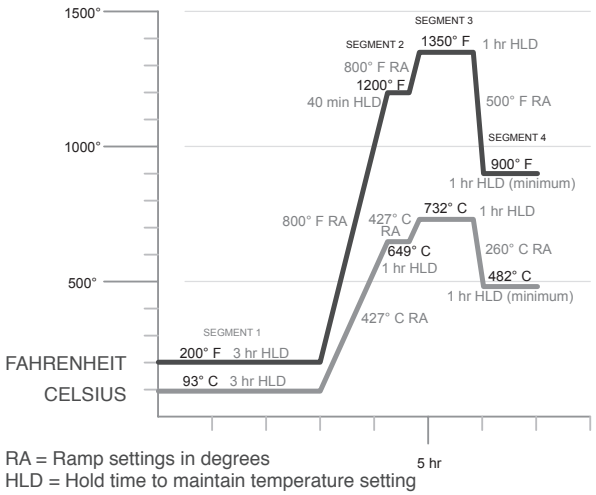
EC500 has a shorter program than other castable materials. The higher wax content allows patterns to reach the desired ash content level a lot faster than polymers such as the PIC100 and PIC100 G resins. A lower melting point equates to a higher level of pre-printing diligence to achieve a successful print with this material in its resin form. Casting results may vary depending on room temperature and relative humidity. The investment can be much harder and therefore take a little more time to divest based on these ambient factors.

EC500 should be stored at or above 73° F / 23° C for the desired level of reactivity. Keep resin in bottle when not in use.

Preparation of the resin involves warming the material (dissolving) at a temperature of 113° F / 45° C for roughly forty five minutes while in the bottle. Look to see if the material flows easily and is dully transparent and uniform. ***Shake very well.***

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.

EC500 FOUR SEGMENT FIRING PROGRAM



RA = Ramp settings in degrees
HLD = Hold time to maintain temperature setting

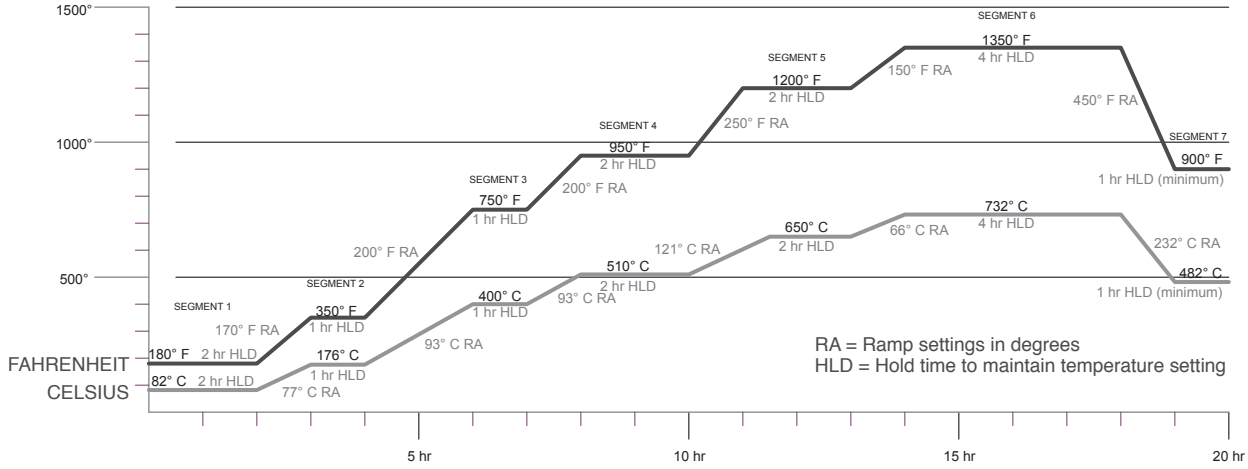
To help prevent porosity, slow down the initial ramp time for EnvisionTEC materials. The critical range is between 1-500 degrees F.

PIC100, PIC100 G, and EPIC Burn Out

PIC100, PIC100 G, and EPIC are all members of the polymer family. They require a slightly different burn out program to achieve a clean pattern divestment. The gradual ramp from SEGMENT 1 to SEGMENT 6 provide a clean transition from an invested pattern to a low-ash burn out.

Spray with Krylon Acrylic Crystal Clear Gloss spray thoroughly, creating an even coat across the entire model to avoid reaction between the polymer and the investment after the part has been cured in the oven. Let set for two hours while spray fully cures before handling.

PIC100, PIC100 G, AND EPIC SEVEN SEGMENT FIRING PROGRAM



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Overspray will cause loss of definition of part. Only spray parts in a well ventilated place. Once the parts are dry, either place onto the casting tree or place in a Ziploc bag with silicone gel.

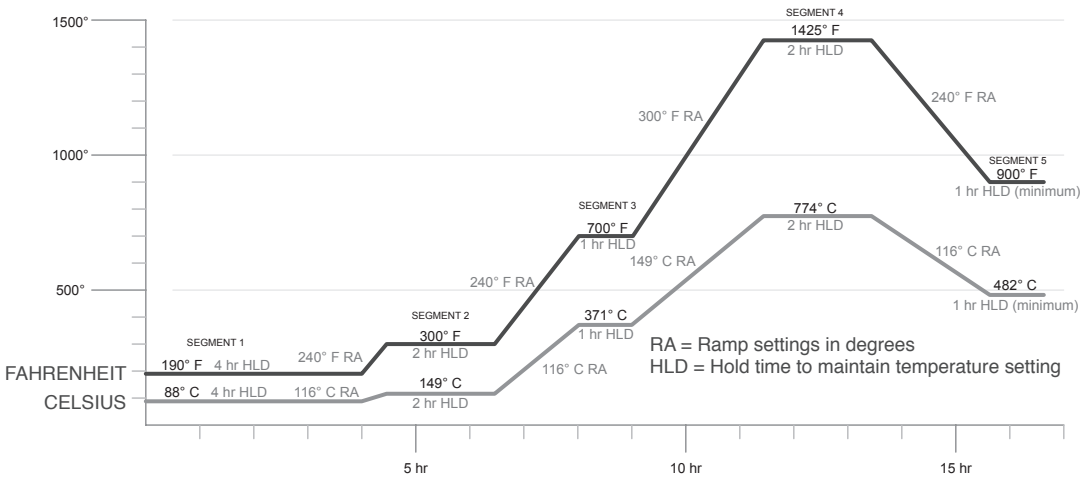
EC3000 Burn Out

EC3000 is ideal for larger pieces, such as signent rings, that need to be cast. Similar to EC500, EC3000 has a higher wax content. As such, EC3000 has a faster firing program than its polymer counterparts, such as PIC100.

Post-processing EC3000 can be expedited by blowing off parts using compressed air to get excess material off of the surface of the part before any 99% Isopropyl alcohol is applied.

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.***

EC3000 FIVE SEGMENT FIRING PROGRAM



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