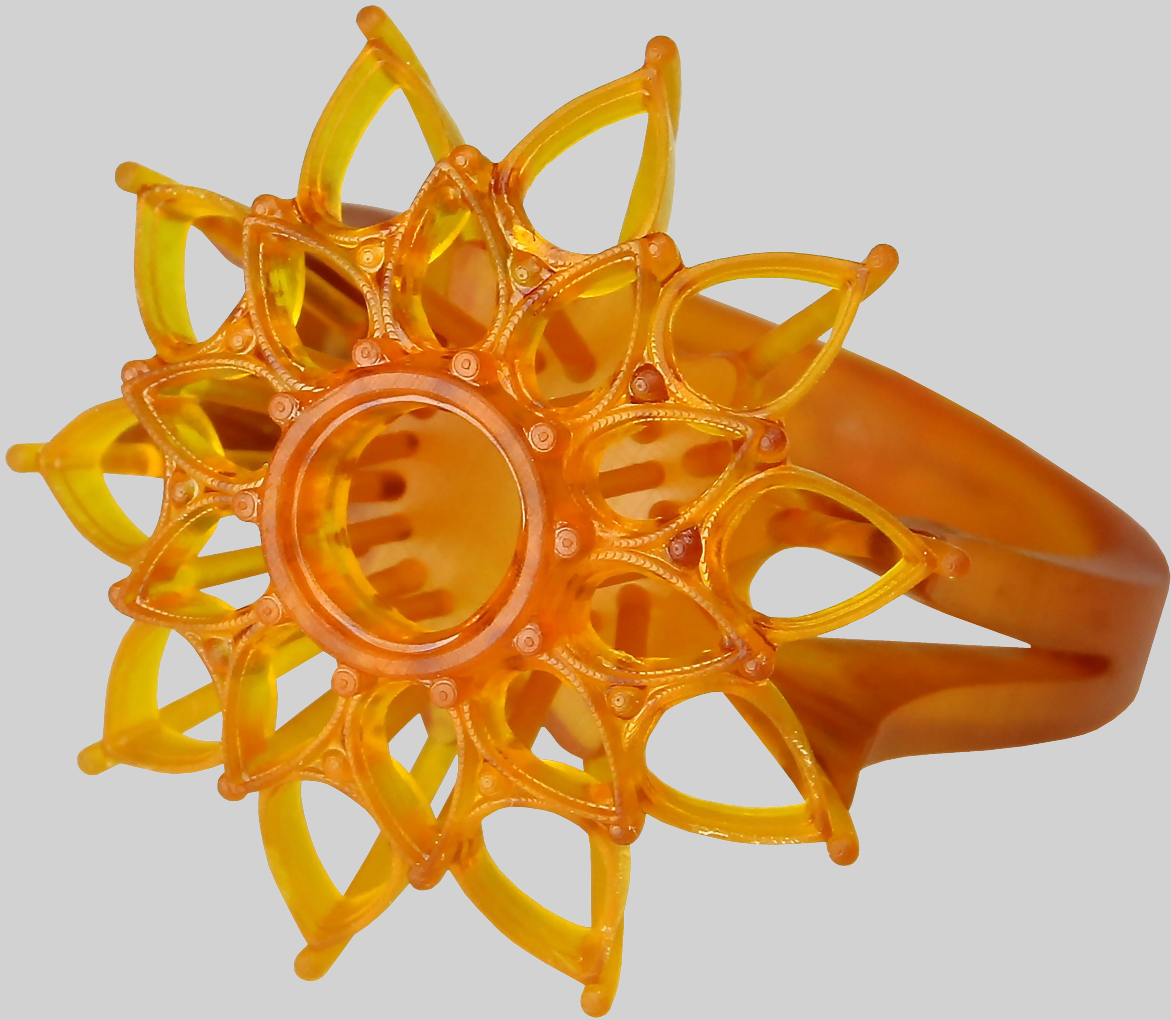


Material Best Practice Guide for Pro XL™ & D4K™



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History of Changes

Date	Changes	Revision
October 2022	Document creation	1.0
October 2023	<ul style="list-style-type: none">▪ Updated About PIC 100▪ Updated Getting Started▪ Updated Software▪ Updated Print Preparation▪ Updated Post-Processing▪ Updated Lost Wax Investment Casting	2.0
November 2023	<ul style="list-style-type: none">▪ Updated About PIC 100▪ Updated Getting Started▪ Updated Post-Processing	3.0
January 2024	<ul style="list-style-type: none">▪ Updated Post-Processing	4.0

About This Guide

This document helps you prepare parts, post-process, and finish using PIC 100 material.

PIC 100 Material Best Practice Guide: 81-00268_R04_EN, January 2024

About PIC 100

High resolution and fine feature detail castable material.

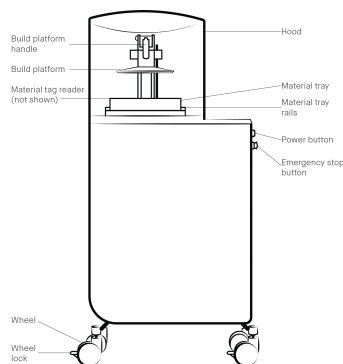
PIC 100 is a photo cured resin that produces the highest quality castable jewelry patterns without sacrificing toughness, ease of handling, and finishing. PIC 100 is a non-wax castable material that is ideal for patterns that require sharp details and/or filigree.

One of the most popular production casting materials in the ETEC portfolio, PIC 100 Series is the company's original Plastic Investment Casting (PIC) material. PIC 100 is ideal for parts up to 5 grams finish weight, such as bridal jewelry. ETEC recommends casting PIC 100 with Ransom & Randolph's PlastiCast PT or other extra-high- strength investments. Parts printed in PIC 100 burn out clean at moderate temperatures, leaving no ash for clean castings.

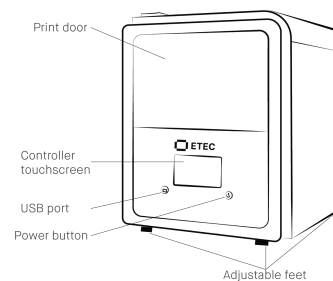
Applicable Printers

This material is tested and approved for the following printers:

- Pro XL™
- D4K™
- Perfactory™ P3, P4, P4 LED, P4K
- Vida™, Vida™ HD, Vida™ HD cDLM™
- Micro, Micro cDLM™, Micro Plus HD, Micro Plus ADV



Pro XL Front View



D4K Front View

Getting Started

Primary Supplies

Primary supplies should be acquired prior to product delivery. Obtain the proper tools to prepare for successful printing and post-processing.

The following supplies are required to print PIC 100 material:

- PIC 100: Product Code RES-01-1000.
- Personal Protective Equipment (PPE).
- Material preparation: Convection oven/dehydrator capable of holding 30° C (85° F).
- Material mixing: Dual Motion Bottle Roller, Product Codes ACC-26-1000 (110V) and ACC-26-1000 (220V), and rubber spatula.
- Material filtering: Cone-shaped paint filter and spare material storage bottle.
- Part removal: Paint scraper.
- Washing unit options:
 - PWA 2000, Product Code ACC-22-2000.
 - Hand washing with soft brushes and 2 post-processing containers, 1 qt each.
- Washing agent: 99% Isopropyl Alcohol.
- Spray bottle.
- Air compressor.
- Parchment paper.
- Curing unit options:
 - Otofash, Product Code ACC-00- 0007.
 - PCA 2000, Product Code ACC-32-1000.
 - PCA 4000, Product Code ACC-06-1000.



Note: See [Pro XL Site Prep Guide](#) and [D4K Site Prep Guide](#) for more information on the recommended accessories.

Design Parts

It is recommended to print parts that are equal to or less than 5.0 g in mass. Exceeding 5.0 g increases the risk of the investment fracturing during the burnout cycle.

Some parts printed in PIC 100 must be printed on supports. Keep this in mind when designing parts for PIC 100.

It is recommended to add 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

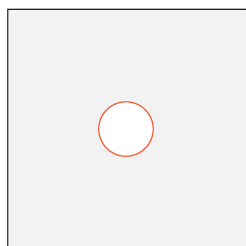
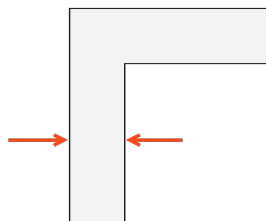
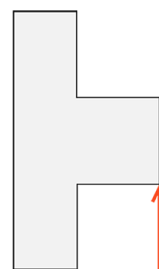
All design features include recommendations for absolute minimum feature size and recommended minimum feature size. Absolute minimums are the smallest resolvable feature size based on printability. Recommended minimums are provided to minimize potential warpage and account for part fragility. Part feature 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 (Ex: text, small channels, etc.). They should not be used for the main components of design methodology.

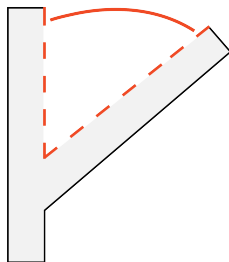
Design Feature	Absolute Minimum (Pro XL & D4K)	Recommended Minimum (Pro XL & D4K)
Wall Thickness	0.3 mm	0.5 mm
Unsupported Wall	0.4 mm	0.5 mm
Embossing Height	0.075 mm	0.15 mm
Positive Features	0.3 mm	0.5 mm
Negative Features	0.04 mm	0.5 mm
Hole Diameter	0.3 mm	0.6 mm
Bridge Gap Note: The value is maximum, not minimum.	0.3 - 1.5 mm	0.5 - 2.0 mm

Design Feature	Absolute Minimum (Pro XL & D4K)	Recommended Minimum (Pro XL & D4K)
Unsupported Horizontal Overhang Note: The value is maximum, not minimum.	1.5 mm	2.0 mm
Engraving Depth	0.1 mm	0.3 mm
Cylinder Wall Thickness	0.3 mm	0.45 mm
Wire Thickness	0.45 mm	0.6 mm
Text Depth	0.075 mm	0.15 mm
Text Height	0.075 mm	0.15 mm
Text Thickness	0.3 mm	0.45 mm
Minimum Spacing	1.0 mm	2.0 mm

*Hole Diameter**Unsupported Horizontal Overhang**Minimum Wall Thickness*

Self-Supporting Angle

The recommended maximum self-supporting angle for parts printed with PIC 100 is 45° from vertical (perpendicular to the build platform).

*Self-Supporting Angle*

Software

Orient Parts Envision One RP Software

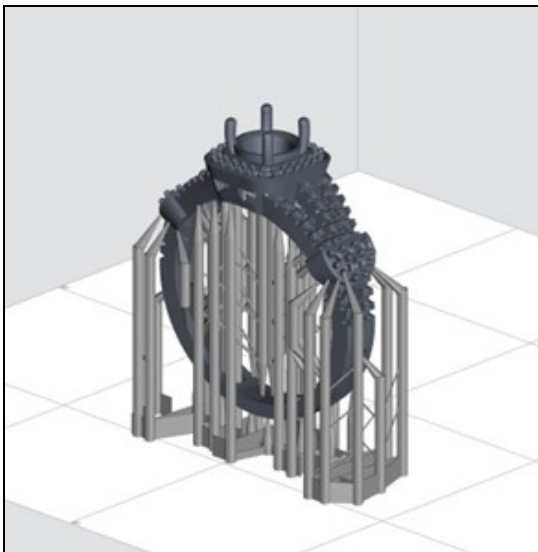
Envision One RP Software automatically orients your model, adds supports, if necessary, and sends the file to the printer, resulting in your three-dimensional model. Everything that is printed using ETEC printers must pass through this software successfully.

- **Spacing:** Place parts a minimum of 1.0 mm apart.
- **Level at build platform:** Place unsupported parts directly on the build platform. Place supported parts 4.0 mm from the build platform.
- **Resolution:** 25-50 μ m Z Resolution (dependent on layer thickness).

Support Parts Envision One RP Software

Some approved applications require supports. Always use the PIC 100.ini support file:

- **Minimum support base:** 0.50 mm
- **Minimum contact tip:** 0.45 mm
- **Minimum support beam height:** 4.0 mm



Supported Part in Envision One RP Software



Tip: If the part design includes casting sprues, make sure the sprues extend all the way to the build platform. Do not add supports to casting sprues.

Print Preparation

Crystallization

PIC 100 can exhibit a crystal formation dependent on environmental temperature. This phenomenon is referred to as *crystallization* and has been observed in new bottles of resin and overtime in the material tray.

If crystallization is observed, then the material should be heated:

1. Place the sealed material bottle in a convection oven/dehydrator.



Note: If the crystallized material is in the material tray, then pour the material into a clear, opaque bottle and place this bottle in the convection oven/dehydrator.

2. Set the temperature to 30° C (85° F).
3. Warm the material bottle in the convection oven/dehydrator for 30 minutes.



PIC 100 crystallization

Mix Material

PIC 100 material separates easily and must be mixed prior to use on the printer:

1. Place the sealed material bottle on the Dual Motion Bottle Roller for a minimum of 30 minutes.
2. Wait for bubbles to subside before filling the material tray.
3. Mix material in the material tray gently with a rubber spatula before each print. The material should be a uniform color.

Fill Material Tray

Do not overfill the material 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 tray. If found, filter the material. See [Maintain Materials Pro XL](#) and [Maintain Material D4K](#)

To add more material to the printer, carefully pour material into the material tray between prints. See [Add Material Pro XL](#) and [Add Material to Material Tray D4K](#).



Note: Do not add material to the material 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 PIC 100

Before starting a print:

1. Ensure the build platform is clean and free of cured material.
2. Ensure the material tray is free of cured material.

To start and complete the print, see [Pro XL Operations & Maintenance Guide](#) and [D4K Operations & Maintenance Guide](#).



Tip: Small parts tend to "pop off" of the build platform, so do not apply significant pressure for part removal.

Post-Processing

Materials Safety

Safety data sheets (SDS) for materials used in the printing process are available either 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

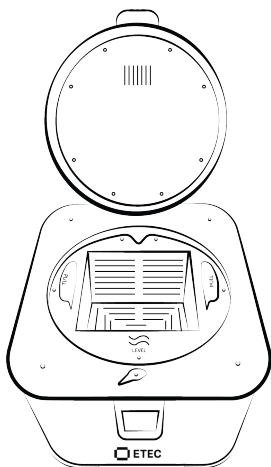
Allow the material to drip off parts for 15 minutes before cleaning. Then, immediately clean parts.



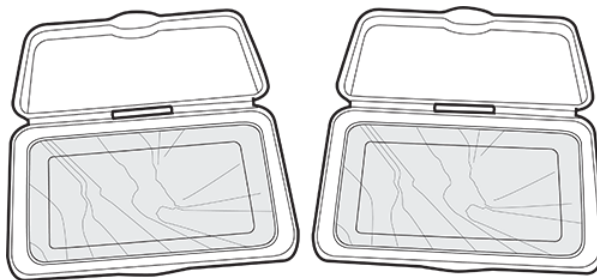
Tip: Time the end of the print in order to post process parts immediately. Ensure clean 99% IPA is available for part washing.

Clean parts using one of the following methods:

- PWA 2000. See [PWA 2000](#).
- Hand washing with two post-processing containers.



PWA 2000, open



Post-processing containers filled with 99% IPA



Important: Do not expose PIC 100 to alcohol for longer than 5 minutes. Excess exposure to alcohol may dry out the parts and lead to casting issues.

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 2.5 minutes on High.
3. Remove the parts as soon as the program is complete. Spray the parts with 99% IPA and then dry the parts with compressed air.
4. Repeat **Steps 2 - 3** for a second wash cycle.
5. If the surface of the parts is glossy after drying, spray the parts with 99% IPA and then remove all residue with compressed air. The surface should be matte and smooth.

Clean parts by hand with two post-processing containers:

1. Fill both containers with 99% IPA.
2. Submerge the parts in the first container for 2.5 minutes. Agitate parts gently with a brush, focusing on smaller/intricate features.
3. Remove the parts, spray with 99% IPA, and then dry with compressed air.
4. Using the second post-processing container, repeat **Steps 2 - 3** for a second wash cycle.
5. If the surface of the parts is glossy after drying, spray the parts with 99% IPA and then remove all residue with compressed air. The surface should be matte and smooth.



Tip: Parts with large surface areas can be difficult to clean. Use soft brushes and 99% IPA to remove remaining resin after cleaning.

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 10 minutes.

Post Cure Printed Parts

Post cure parts using one of the following curing options:

- Otofash G171. See [Hardware Operations Otofash](#).
- PCA 2000. See [Hardware Operations PCA 2000](#).
- PCA 4000. See [Programs and Features PCA 4000](#).

Cure parts with the Otofash:

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 for 6,500 flashes.
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 PCA 2000:

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 for 32.5 minutes at 60° 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**.

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 for 15 minutes at 60° 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**.

Lost Wax Investment Casting

Lost wax casting includes many variables that must be handled precisely to achieve consistent results.

Casting Trees

When constructing casting trees, increase the connection between sprues by 10-30% of the sprue diameter.

Taper sprues to help with metal flow during casting. Round, smooth, and thick transitions will increase the speed of the molten metal throughout the sprue system.

When considering sprue placement on the printed parts, treat PIC 100 parts just as you would your hand carved wax models.

Some mparts may require more sprues to vent the material during casting. Add more sprues to large or thick pieces.

Adhere wax sprues to PIC 100 parts:

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



Note: For best results, make sure the vent point is large enough to allow for the flow of material out of the flask. Use a thicker base when working with polymers versus wax for the burn out.

Investment

R&R Plasticast PT investment is recommended for platinum casting. For all other metals, we recommend R&R Plasticast investment.



Important: Follow the manufacturer's instructions for investing procedures. Give the flask a maximum of 4 hours to bench set.

Firing

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

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.

Burnout Firing Program

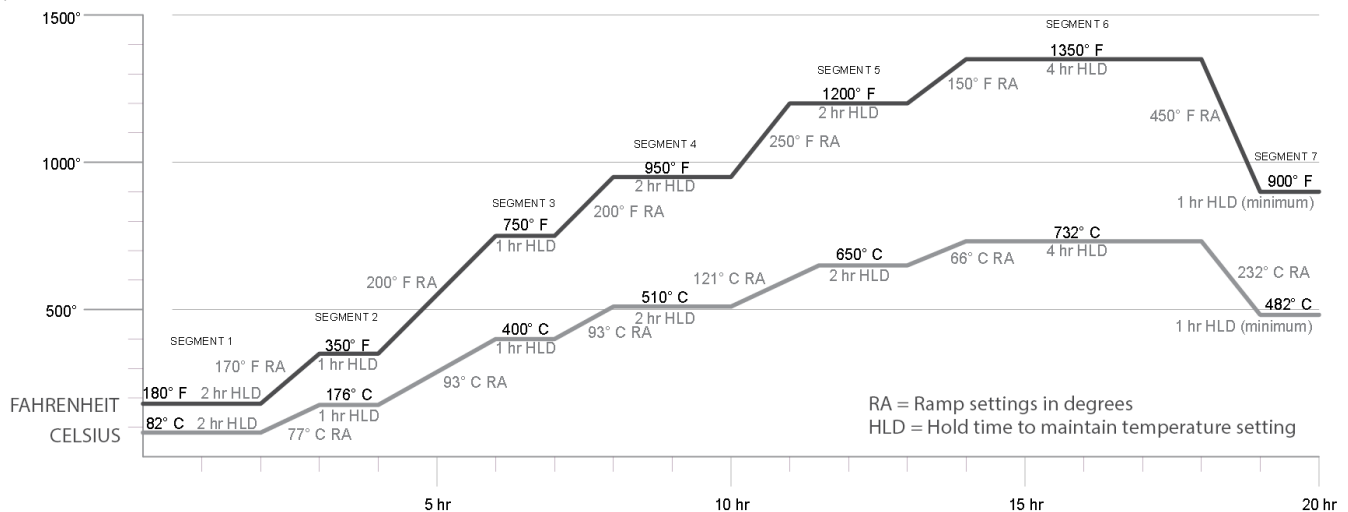


Important: This firing program is for casting with a 3.5 in (88.90 mm) flask diameter, 800 ft (243.84 m) above sea level. If casting with a flask larger than 3.5 inches, add 1 hour of hold time to the burn out for each inch.



Note: Modifications to the burnout procedures may be necessary due to a variety of factors, such as size of flask, humidity level, and type of kiln used.

PIC 100 is an all polymer-based material. It requires a specific 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.



PIC 100 Seven Segment Firing Program

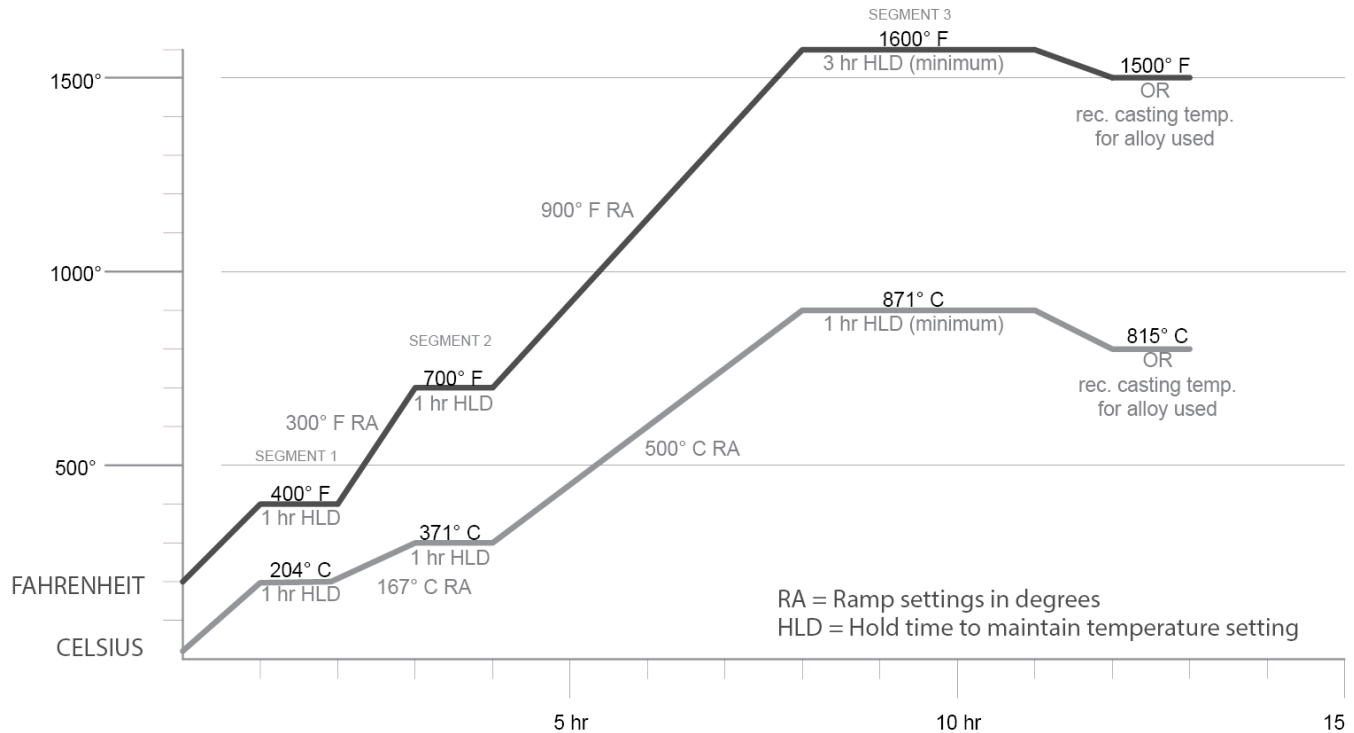
In **Segment 1**, the 2 hour hold at 190° F (88° C) may be increased to 4 hours for great casting results.

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.

Platinum Burnout Firing Program

Platinum requires higher temperatures to cast. When casting platinum, use R&R Plasticast PT investment.

Segment 3 can be extended and tailored to best suit the ambient casting factors, and the size of the flask used.



PIC 100 Three Segment Platinum Firing Program

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