DALLOZ
stones & rough

Stones in wax setting and casting recommendations

This document aimed to help jewellers to get best results while casting stones in wax pieces. Following procedures and advises drawn the results of different experiences and developments, willing to establish best practises for stones-in-wax casting.

As many factors in production process can affect results, you must ensure that every step is under controlled procedures, performed and measured with calibrated equipment and tools. Testing should always precede full-production runs.

1. Model Making

In wax setting and casting process the key point is the preparation of the model. An adequate preparation leads you an easy, precise and safe wax in stones setting and best quality for final product.

> The quality of the master model is essential for all processes to follow and the quality of the master directly affects the quality of the end-results.

a. Stone Seat

It is necessary to engineer the master pattern firstly to prepare the seat for the stone as accurately as possible and allow the stone to click in the wax easily and securely.

> The stone and wax surface contact should be limited as much as possible to reduce heat transfer from metal to stone and reduce metal refraction.
> Sufficient space between stones should be maintain. Stones should not touch at the girdle or overlap each other to avoid stones breakage.

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b. Shrinkage

Three kinds of shrinkage must be taken into consideration.

- Rubber mould shrinkage
- Wax shrinkage
- Metal shrinkage

All shrinkage factors have a critical impact on the setting of the stones. They should be accounted to ensure strict dimensional control to maintain stone integrity and avoid stones breakage.

Shrinkage data could be provided by your consumables suppliers.

2. Wax injection

It is possible to use most type of wax for stone-in-wax setting. It is however necessary for the wax to have a certain elasticity to allow the stones to really click into place.

General practices :

- After injection, wax patterns temperature should lower down and remain to ambient temperature of the workshop. Using warm injected pieces could result in distortion of the wax pattern.
- All waxes injected in a day should be set same day. Wax patterns set overnight can become fragile or break when the stone is clicked into the stone seat.
- Clean and smooth all wax patterns in preparation of the stone setting.

3. Stones quality

Not all stones can be cast-in-place. Casting may affect stones appearance, colour, and involve breakage risks.

a. Hardness and rough quality

Stones should be made of hard and flawless material to avoid stones breakage. All **Dalloz Stones®** (materials listed below) are made with the highest purity rough and can stand under high temperatures (see 6. Burnout Cycle and Annex 1. Colour Heat Resistance).

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	Composite	Refractive index	Dispertion	Hardness	Specific gravity
Diamond	C	2.42	0.044	10	3.52
Cubic Zirconia	$Zr\ O_2$	2.16	0.06	8.5	6
Corundum	$Al_2\ O_3$	1.77	0.018	9	4
Spinel	$Mg\ Al_2\ O_4$	1.73	0.02	8	3.64
Hydrothermal Emerald	$Be_3\ Al_2\ (Si\ O_3)_6$	1.570 - 1.577		7.5	2.7
Nano Crystal	Si-Zr-Al-Li	1.5 - 1.7	NC	6.5 - 7	NC
Nano Sital	Y-Al-Si-O	1.6 - 1.7	0.015	7	3.2 - 3.8
Siliconite	Si	Metallic	NC	7	2.33

b. Size and Dimensional consistency

Cut stones used for wax-casting must be very consistent in size and dimensions to stick as close as possible to masters' tolerances.

Dalloz Stones® is using the best cutting technologies and controlling tools to ensure prefect calibration in geometry, girdle thickness, appearance and colour shading.

Inaccurate stones may be castable in the wax, however, heat and pressure from the casting process can lead to stones breakage.

4. Stones Setting

The stones should firmly snap into the wax. It may be necessary to gently press on the pavilion of the stones to ensure they properly "click" into wax.

- Slight adjustments to the way the gems are set may be made with a heated wax pen

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- Stones should not touch or overlap each other to avoid stones breakage.
- Excessive handling can lead to a greasy layer on the stones resulting in a thin film of metal-plating over the surface.
- If for some reason a hot wax tool is needed to repair the wax, take care of not creating wax film on the stones.

Quality Control of after stone setting into wax must be performed with adapted control tools.


5. Wax-tree assembly

A good assembly of the wax tree is important to ensure proper metal filling process of every wax patterns.

- For stones-in-wax casting, it is recommended to use a large feed sprue since casting is commonly performed at a lower than usual flask temperature. The main sprue in a cast tree acts as a reservoir of heat and metal to feed the castings will aid in the metal filling process.
- Ensure a good contact between the sprue and the pattern. Angle the wax patterns outward at about a 45-degree angle to assist in the smooth metal-filling.
- Avoid mixing light and heavy wax patterns on the same tree if possible. If not, lighter weight rings should be placed toward to the top and heavier ones lower down the tree.
- Light detailed castings require higher flask temperatures than heavy castings.
- Due to higher temperature and metal pressure on the top of the tree that may lead to stones breakage, it is recommended :
    - To leave some space (20mm) between the top of the tree and the first row of wax patterns.
    - Not to place stones-in-wax patterns on the first 2 row.

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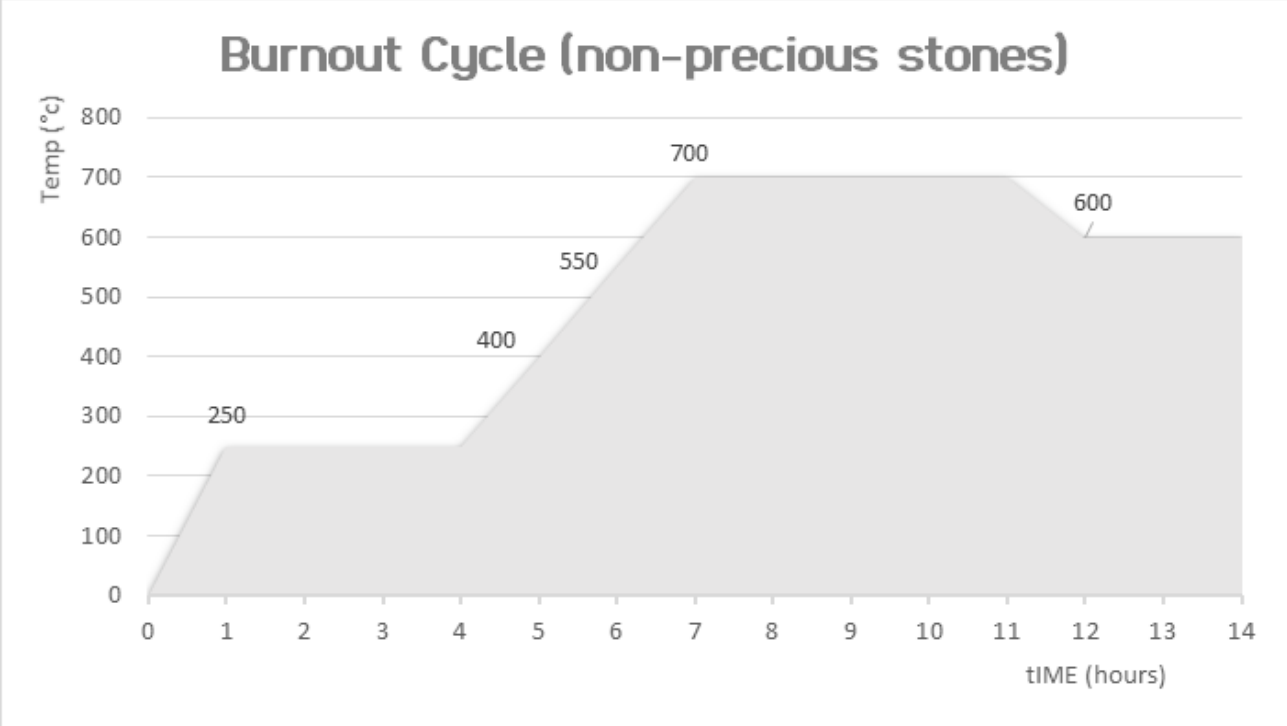
6. Burnout cycle



Metal used for stone in wax process must be completely replaced more frequently than for standard casting processes.

- Maintaining temperature at during first hours of the burnout schedule is important to remove much of the residual carbon in the mould and avoid atmosphere reduction (which can lead to turn white CZ stones into Yellowed Cz).
- Do no overload flask into the furnace.

7. Casting

Casting stones-in-wax jewellery can be done with either by vacuum or centrifugal casting methods, however vacuum assist is generally preferred.

Keep and control the metal temperature as low and as possible to avoid heat shocks.

Excessive metal pressure sometimes can lead to stones breakage.

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Metal	Melting Pouring Temperature	Flask Casting Temperature
Silver	950 - 1050	450 - 600
9ct Gold Y	940 - 1040	500 - 600
9ct Gold W	970 - 1070	500 - 600
14ct Gold Y	900 - 1000	500 - 600
14ct Gold W	1150 - 1250	500 - 600
18ct Gold Y	940 - 1040	500 - 600
18ct Gold W	1025 - 1125	500 - 600
22ct Gold Y	1000 - 1150	600 - 700

8. Flask cooling and investment removal :

It is critical that the casted flask is properly cooled prior to any devesting processes.

- Quenching a hot flask shock the stones and result in breakage or cracks.
- Referencing the cylinders is necessary to ensure proper cooling control of each flask.

- 1st step : After the casting, let the flask cool for 2h until temperature goes down to 200°C.
- 2nd step : Place the flask into the cooling bath (bottom of the flask into 5cm water) for 1h30 to go down to 100 ° C.
- 3rd step : Gently place the cylinder into the acid bath which is at 80 ° C.
- 4st step : water jet cleaning, pressure cleaning must not exceed 7/8 bar.

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