



TECHNICAL INFORMATION

CASTING CUBIC ZIRCONIA IN PLACE WITH UNITED DEOXIDIZED STERLING SILVER ALLOYS

United Deoxidized Sterling Silver Alloys are ideal for casting with Cubic Zirconia set in wax. The castings will come out of the investment white and free from the black surface oxidation found on regular sterling silver alloys. Porosity in the castings will be greatly reduced and tarnish resistance greatly improved when using United Deoxidized Sterling Silver Alloys.

Top quality CZ's should be used for casting wax set jewellery. The CZ's should be dimensionally accurate providing uniform sizes for wax set mountings.

Designs selected for wax set casting must allow support of the gems in at least two places by surrounding investment. The CZ's must be securely held in place to withstand investing, burn-out and casting without coming loose.

Models should be designed for wax set casting. Model makers should make allowances for shrinkage factors in the rubber moulds and waxes. The settings should have pre-knotched, bent, prongs and/or pre-cut channel seats to allow the stones to be snapped into place and held securely. Using existing models for gem stone set DI wax casting often results in poor fitting gemstones and fill problems due to inadequate springing.

Larger sprues are needed for casting CZ's in place. The CZ's will chill the molten metal during the cast and a well thought out sprue system is needed to avoid shrinkage porosity in stone set areas. Multiple sprue systems may be needed on some designs to properly feed molten metal to the castings.

Waxes used for casting CZ's in place should have a good shape memory and the ability to snap back in place after the stone is set in the mounting. A mixture of 50% Kerr Aqua and 50% Blue Plastowax works well for wax setting. A number of wax suppliers have special formulations for wax set casting that will provide a good shape memory in injected waxes.

Waxes should be carefully inspected after injection. All parting lines and flashing should be removed before attempting to set the stones in the wax. Pay close attention to mounting areas, edges of prongs and seating areas in the wax patterns as these areas are harder to clean up after casting in metal.

Helpful tools for setting CZ's in the waxes are vacuum tweezers, sharp pointed tweezers, small rounded spatulas, small pointed spatulas, electric wax pens and a small alcohol burner to heat the spatulas.

Setting the CZ's in the wax patterns can be aided by the use of vacuum tweezers to pick up and hold the smaller stones while a gentle pressure is used to insert them

into the mountings. This is where: the type of wax being used is important as the stones will snap into place easily using the correct wax mix. For larger stones hand tweezers can be used assisted by pointed spatulas. A heated wax pen applied to the top of large stones, warming them up will result in a softening of the wax allowing easier insertion.

Setting CZ's in the rubber mould may be accomplished on certain designs. The models are set with CZ's before making the rubber mould leaving recesses in the rubber mould allowing stones to be set in the mould and the wax injected around them. This method is not very popular due to wax flashing problems and alignment problems with the set stones.

Channel set baguettes set in wax require close attention to spacing. A small space is required between the closely set stones to prevent the stones from touching. Failure to leave a space between the stones can result in cracked stones. The molten metal will shrink as it solidifies compressing the channel set baguettes. If no space is allowed between the stones for metal shrinkage, the CZ's can misalign or crack from compression. A small feeler gauge: is often helpful in this process -.005" to .010" depending on stone size and number of stones per channel.

Gem set wax patterns should be carefully inspected before assembling wax trees. The alignment and fit of the CZ's may need a slight adjustment before committing the stone set waxes to casting. Check the table height on the gems and make any needed adjustments with a heated wax pen. It is much easier to correct any setting problems in the wax patterns than it is after casting in metal.

Gem set wax patterns Should be mounted on a tree rather than on a sprue base. The size of the tree will be determined by the flask size and casting equipment being used. Be sure to put enough angle on the waxes when attaching to the main sprue rod, a 45 degree angle is good. Be sure to leave a one inch space between the sprue base and the first row of wax patterns, this will avoid the main area of shrinkage on the cast tree. It is helpful to dip the assembled wax trees in one of the proprietary wetting agents and allow it to dry before investing the wax tree as this will help prevent air bubbles from sticking to the waxes.

Special stone casting investments or additives are not required for CZ's. Regular investment powder can be used for casting CZ's set in wax. The boric acid additives in the stone casting investments and various proprietary additives are best used for diamonds or other gemstones to protect them from heat. The boric acid contained in special investments or additives may dull the CZ's. Be sure to follow the investment manufacturer's instructions as to water to powder ratios, mix times, vacuum times and set up times for investing.

Make sure invested flasks have sufficient vacuum time to get rid of air bubbles adhering to the waxes. Vibration during the final vacuum cycle is helpful in releasing trapped air bubbles. Any air bubbles trapped under or near the stone set areas will create metal nodules on the castings that can be difficult to remove. A very small amount of liquid dishwashing detergent added to the water used to make the investment aids the wetting properties of the investment to avoid trapped air bubbles. Allow invested flasks to set up for two hours before starting the dewaxing process.

Insufficient set up time can cause investment breakdown during the de-waxing process and cause rough castings.

Steam de-waxing can be used on stone set flasks. Allow flasks to set up for two hours before placing in a preheated steam de-waxer. The de-wax time should be limited to one hour maximum. The flasks should be immediately transferred to a preheated burn out oven set at 275 to 300 degrees F. Regular burn-out schedules can be followed.

Burn-out ovens need accurate calibration for gem stone in place casting. Erroneous temperature read outs can cause burning or discoloration of the stones during the burn out process if overheating occurs. Have your oven calibrated before doing stone set casting. Be aware of any hot spots in the burn-out oven that may cause uneven heating of the flasks.

Burn out ovens used in this process, require adequate air supply and exhaust to allow a complete burn-out of carbon residues from the wax. The bottom plate in the burn-out oven should have grooves to allow an adequate air supply inside the flask during the burn-out process. If the bottom of the oven is flat, some heat resistant ceramic supports should be used to slightly elevate the flasks to allow better air flow into the main sprue area.

Regular burn-out cycles can be used with CZ's set in wax. Top temperatures of 1350 degrees F / 732 degrees C have successfully been used in burn-out cycles with top quality cubic zirconia. For many years it was thought that CZ's would be destroyed at high burn out temperatures but it has been found that the CZ's will tolerate regular burn out cycles without harm. Some casters prefer a slower ramping of temperature with CZ's during burn out but experience has shown that regular burn-out cycles can be used. Poor air flow in burn-out ovens during the burn out cycle has been known to cause a yellowing of CZ' s,

Casting may be done by Vacuum or Centrifugal methods. Vacuum casting is more popular for casting gem stones in place due to less turbulence being developed during the cast that could dislodge the gem stones. Excellent results have been obtained with centrifugal casting, Fancy, high priced casting machines are not necessary to cast CZ's In place, excellent results have been obtained using regular casting equipment with a good operator.

Casting range for United Deoxidized Sterling Silver Alloys is 1000 to 1020 degrees C / 1832 to 1868 degrees F. Boric acid is the recommended flux for our deoxidised Sterling Silver Alloys and a reducing or inert gas cover is helpful to prevent oxidation during the melting process. Flux is not recommended in bottom pour casting machines due to causing the plunger rod to stick in the crucible. The casting range for United Deoxidised Sterling Silver Alloys will be somewhat hotter than traditional Sterling Silver. Do not use silicon carbide crucibles or charcoal covers on United Deoxidised Sterling Silver Alloys. Most casting problems experienced with our alloys are due to casting the metal too cold or having burn out problems. Instruction sheets are available for all United Deoxidised Sterling Silver Alloys.

Regular flask temperatures can be used to cast CZ's in place with well sprued designs. Higher flask temperatures are normally used for light weight designs and lower flask temperatures are used with heavier designs.

Do not quench flasks after casting. Allow flasks to cool to room temperature before removing the investment, C Z Manufacturers often recommend letting flasks set overnight before investment removal. Quenching the CZ set castings when hot will cause the CZ's to crack from thermal shock, It is safer to let the flasks cool to room temperature and then remove the investment by tapping the flask with a hammer to loosen the investment. The hardest part of casting gem stones in place is removing the investment after casting. Once the investment cast tree is removed from the flask, hitting the sprue button with a hammer will knock off most of the investment on the tree. The CZ set castings can then be water blasted and soaked in a de-vesting solution to remove any remaining investment. An ultra-sonic machine is very helpful in removing investment from hard to reach areas-

Inspect the castings for missing stones. The missing stones can be recovered from the investment by running the broken investment through a window screen and picking out the stones. Check the castings for any misalignment of stones before finishing the castings.

Magnetic Pin Tumblers are very useful in shining up hard to reach areas of the casting such as undercuts and around stone set areas. The polishing time is about 20 minutes in these units.

Avoid bombing or heavy electro-stripping on CZ set castings. The removal of metal in these processes can cause the CZ's to come loose from the mountings when it attacks delicate prong areas.

Use greater care in finishing gem set castings. Check the media used for mass finishing to make sure it won't scratch or damage the CZ's. Be careful finishing the prong areas of the gem set castings to avoid polishing away the prong settings. Remove all investment powder from buttons and sprues before re-melting. Be sure all investment powder residue is removed from scrap material before re-melting it. Any adhering investment will decompose at elevated temperatures releasing sulphur compounds. The sulphur compounds will combine with oxygen forming sulphur dioxide gas and will be taken in by the molten metal causing porosity in the castings. Reuse of scrap in melting. A 50% scrap and 50% fresh mix is recommended for reuse in United Deoxidised Sterling Silver Alloys unless Our Sterling Silver Replenisher Alloy is used.

Run a few test flasks to determine casting parameters with your equipment. It is wise to run a few test flasks with your C:Z's and equipment before starting production. - This will help establish production procedures and determine if any problems exist in your casting operation.

Gemstone set in wax casting is an evolving technology with new methods, materials and equipment being developed each year. Excellent articles have been published in trade publications and papers have been presented at the Santa Fe Symposium on the subject.

Articles published on gemstone set in wax casting:

Casting with Gemstones Myth or Reality -By Jack Weinraub
American Jewelry Manufacturer- June 1993
Getting the best from Wax Setting -By Editor .
Jewellery News Asia - February 1997
Casting Stones -By Ajit Menon
American Jewelry Manufacturer -March 1997
Setting Pretty -By Andre Janiszewski
American Jewelry Manufacturer -March 1998

Check with your CZ supplier for additional information. Some of the CZ suppliers have information booklets on casting CZ's set in wax.

For further information on stone-in-place casting please visit our SRS web site on

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