

# Crystal Clear™ 220 & 221

Clear Urethane Casting Resin



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## PRODUCT OVERVIEW

Crystal Clear™ 220 & 221 are water white clear resins made specifically for applications that require absolute clarity. These are “heat cure” systems and are harder versions of our popular **Crystal Clear™ Series** resins (Shore 85D). Cured castings are UV Resistant (resists yellowing due to ultra-violet light exposure) and are not brittle. Vibrant colors and color effects are achieved by adding pigment dispersions. Applications include encapsulation, making prototype models, lenses, sculpture reproductions, decorative cast pieces, jewelry, special effects and props. Crystal Clear™ 220 has been certified for use as a lens material for DOT and FAA applications.

**CAUTION: NOT FOR HOME USE. THIS PRODUCT IS FOR INDUSTRIAL USE ONLY.** With adequate local exhaust ventilation, respiratory protection is not normally required when using this product. Where risk assessment shows air-purifying respirators are appropriate, follow OSHA respirator regulations and European Standards EN 141, 143 and 371. Protective clothing (gloves and long sleeves) is required to minimize the risk of dermal sensitization. If breathing is affected or a dermal rash develops, immediately cease using this product and seek medical attention. Read SDS before using.

## TECHNICAL OVERVIEW

Mix Ratio: 100A:75B by weight
Mixed Viscosity (cps): 675 (ASTM D-2393)
Specific Gravity, g/cc: 1.07 (ASTM D-1475)
Specific Volume, cu. in. /lb.: 25.9 (ASTM D-1475)
Pot Life: CC220 - 22 minutes CC221 - 75 Minutes
Demold Time: Overnight Followed By Post-Cure
Color: Clear
Shore D Hardness: 85D (ASTM D-2240)
Ultimate Tensile: 8,190 psi (ASTM D-638*)
Tensile Modulus: 286,000 psi (ASTM D-638*)
Elongation @ Break: 12 % (ASTM D-638*)
Flexural Strength: 11,400 psi (ASTM D-790*)
Flexural Modulus: 305,000 psi (ASTM D-790*)
Compressive Strength: 10,100 psi (ASTM D-695*)
Heat Deflection Temp: 176°F/80°C (ASTM D-648*)
Compressive Modulus: 87,000 psi (ASTM D-695*)
Shrinkage: 0.0173 in/in (ASTM D-2566*)
Compressive Modulus: 87,000 psi (ASTM D-695*)
Refractive Index: 1.50084 at 20°C 1.50035 at 25°C
Casting Thickness Max, in. CC220: 3 in. (7.62 cm) CC221: Variable

\* Value measured after 7 days at 73°F/23°

## PROCESSING RECOMMENDATIONS

### PREPARATION...

**Safety** - Store and use at room temperature (73°F/23°C). These products have a limited shelf life and should be used as soon as possible. Good room size ventilation is essential. Wear safety glasses, long sleeves and rubber gloves to minimize contamination risk. Wearing a NIOSH approved respirator will minimize inhalation of residual fumes. Use in a low humidity environment (below 50% RH). Mixing containers should have straight sides and a flat bottom. Mixing sticks should be flat and stiff with defined edges for scraping the sides and bottom of your mixing container.

**Selecting A Mold Rubber** - Pour into a urethane rubber mold (Vytaflex™ urethane or Brush-On™ series urethane – release agent required), tin cured silicone mold such as Mold Max™ 20, 25, 30 or Mold Max™ STROKE (not Mold Max™ ‘T’ Series) or Mold Star™ 15, 16 or 30 platinum cured silicone (not Mold Star™ ‘T’ Series). Do not use other rubber mold products.

If you are unsure about surface compatibility, a trial casting should be made. To prevent cure inhibition, post-cure newly made Mold Max™ silicones for 8 hours at 150°F/60°C and let cool prior to casting resin.

For Best Results: Pre-heat the rubber mold at 212°F/100°C for 4 hours before mixing & pouring Crystal Clear™. This will minimize the chances that cured castings will exhibit casting phenomenon such as fish-eyeing, suck back, corner rounding, large bubbles, etc.

**Adding Color Pigments to Crystal Clear™ Resins** - it is very easy to add varying degrees of color to Crystal Clear™ resins. The recommended colorant is UVO™ Color Pigments available from Smooth-On. Other colorants may “color-shift” in resin castings over time. Thoroughly pre-mix UVO™ pigment into Crystal Clear™ Part B (at the desired level) before adding Part A. Mix thoroughly to a uniform color and pour mixture into a mold.

### MEASURING & MIXING...

Liquid urethanes are moisture sensitive and will absorb atmospheric moisture. Mixing tools and containers should be clean and made of metal or plastic. Materials should be stored and used in a warm environment (73°F/23°C). **Stir or shake Part B thoroughly before dispensing.**

**Measuring** - Materials should be stored and used at room temperature (73°F/23°C). The proper mixing ratio is 100A:75B by weight. You must use an accurate digital gram scale to weigh Parts A and B properly. Do not use an

**IMPORTANT:** Shelf life of product is reduced after opening. Remaining product should be used as soon as possible. Immediately replacing the lids on both containers after dispensing product will help prolong the shelf life of the unused product. XTEND-IT™ Dry Gas Blanket (available from Smooth-On) will significantly prolong the shelf life of unused liquid urethane products.

## Safety First!

The Material Safety Data Sheet (MSDS) for this or any Smooth-On product should be read prior to use and is available upon request from Smooth-On. All Smooth-On products are safe to use if directions are read and followed carefully.

### Be careful.

**Part A** is a modified aliphatic diisocyanate. Vapors, which can be significant if heated or sprayed, cause lung damage and sensitization. Use only with adequate ventilation. Contact with skin and eyes may cause severe irritation. Flush eyes with water for 15 minutes and seek immediate medical attention. Remove from skin with waterless hand cleaner followed by soap and water. Refer to MSDS.

**Part B** is irritating to the eyes and skin. Avoid prolonged or repeated skin contact. Remove from skin with soap and water. If contaminated, flush eyes with water for 15 minutes and seek immediate medical attention. Use only with adequate ventilation.

**Important:** The information contained in this bulletin is considered accurate. However, no warranty is expressed or implied regarding the accuracy of the data, the results to be obtained from the use thereof, or that any such use will not infringe upon a patent. User shall determine the suitability of the product for the intended application and assume all risk and liability whatsoever in connection therewith.

analog scale or attempt to measure components by volume. Dispense the required amount of Part A into a mixing container. Weigh out the appropriate amount of Part B and combine with Part A.

**Mixing** - Mix SLOWLY, but thoroughly, for at least 90 seconds making sure that you scrape the sides and bottom of your container several times. If coloring or filling Crystal Clear™ product, add filler or pigment dispersion to Part B and mix thoroughly before adding Part A.

Bubbles in the finished casting will be greatly reduced by vacuum degassing prior to pouring. Subject mixture to 29 h.i.g. mercury in a suitable vacuum chamber for until mixture rises, breaks and falls. Allow for 3 to 4 times volume expansion in mixing container.

## POURING, CURING & PERFORMANCE...

**Pouring** - If casting Crystal Clear™ into a rubber mold, pour mixture in a single spot at the lowest point of the mold. If encapsulating an object, do not pour the mixture directly over the object. Let the mixture seek its level. A uniform flow will help minimize entrapped air.

**For Best Results:** Bubble elimination is best achieved by pressure casting. After pouring the mixed compound, the entire casting assembly (mold, dam structure, etc.) is placed in a pressure chamber and subjected to 60 PSI (4.2 kg/cm<sup>2</sup>) air pressure for at least 16 hours prior to heat curing.

### Curing Options

**Room Temperature Cure - Followed By Post Cure** - Allow material to cure overnight at room temperature (73°F/23°C). Place entire mold structure in an oven and cure at 150°F/65°C for 4 hours, followed by 4 hours at 212°F/100°C. Allow casting or part to cool to room temperature before demolding.

**Heat Curing** - After pouring material into pre-heated mold, heat cure for four hours at 212°F/100°C. Allow casting or part to cool to room temperature before demolding.

**Because no two applications are quite the same, a small test application to determine suitability for your project is recommended if performance of this material is in question.**



**Call Us Anytime With Questions About Your Application.**

**Toll-free: (800) 381-1733 Fax: (610) 252-6200**

[www.smooth-on.com](http://www.smooth-on.com) is loaded with information about mold making, casting and more.