Crystal Clear™ 220 EU & 221 EU

Clear Urethane Casting Resins

www.smooth-on.com

PRODUCT OVERVIEW

Crystal Clear™ 220 EU & 221 EU are water white clear resins made specifically for applications that require absolute clarity and a higher heat deflection (HDT 176°F/80°C). These are"heat cure" systems and are harder versions (Shore 85D) of our popular **Crystal Clear™ EU Series** resins. Cured castings are UV Resistant (resists yellowing due to ultra-violet light exposure), easier to polish, 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 EU has been certified for use as a lens material for DOT and FAA applications. **NOTE: Heat is necessary to properly cure these materials. See "Curing" section on next page.** **Read FAQ regarding Crystal Clear EU Resins carefully before purchasing.** Scan or click the QR Code below to view our FAQ for Crystal Clear EU .

CAUTION: NOT FOR BEGINNERS AND NOT 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.

Scan for FAQ on Crystal Clear EU

	Pot Life @ 73°F / 23°C (ASTM D-2471)	Demold Time ** @ 73°F / 23°C	Ultimate Tensile (ASTM D-638*)	Tensile Modulus (ASTM D-638*)	Elongation at Break % (ASTM D-638*)	Flexural Strength (ASTM D-790*)	Flexural Modulus (ASTM D-790*)	Compressive Strength (ASTM D-695*)	Compressive Modulus ((ASTM D-695*)	Shrinkage in./in. (ASTM D-2566)
Crystal Clear 220 EU	22 Min.	16 Hours	8,190 psi	286,000 psi	12%	11,400 psi	305,000 psi	10,100 psi	87,000 psi	0.0173
Crystal Clear 221 EU	75 Min.	16 Hours	8,190 psi	286,000 psi	12%	11,400 psi	305,000 psi	10,100 psi	87,000 psi	0.0173

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)

Color: Clear

Shore D Hardness: 85 (ASTM D-2240)

Heat Deflection Temp: 176°F/80°C (ASTM D-648*)

REFRACTIVE INDEXES

Crystal Clear 220 EU: 1.50084 at 20°C, 1.50035 at 25°C

Crystal Clear 221 EU: 1.50084 at 20°C, 1.50035 at 25°C

MAXIMUM CAST THICKNESS

Crystal Clear 220 EU: 3 in. (7.62 cm)

Crystal Clear 221 EU: >3 in. (7.62cm)

ELECTRICAL PROPERTIES

Dielectric Strength: 260 Volts/MIL (ASTM D-149)

Dielectric Constant: 3.36 @77°/25°C at 100 Hz (ASTM D-150)

Dielectric Constant: 3.34 @77°/25°C at 1 kHz (ASTM D-150)

Dissipation Factor: 0.00 @77°/25°C at 100 Hz (ASTM D-150)

Dissipation Factor: 0.01 @77°/25°C at 1 kHz (ASTM D-150)

Vol. Resistivity: 1.4 x 1015 @77°/25°C ohm-cm (ASTM D-257)

*Values measured after material has been post cured as directed by product technical bulletin ** Depending on Mass followed by Post-Cure

TECHNICAL OVERVIEW & 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. Environmental humidity should be as low 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. **Use an accurate gram scale to measure the weight of Part A and Part B.**

Selecting A Mold Rubber - Best results are achieved using tin-cured silicone molds (Mold Max™ 20, 25, 30 or STROKE) Do not use Mold Max™"T" Series or other rubber mold materials. Fresh Mold Max molds may cause surface inhibition; pre-heat molds before casting. To prevent cure inhibition, post-cure newly cured Mold Max silicone mold for 8 hours at 150° F / 60° C and let cool prior to casting resin. If you are unsure about surface compatibility, a small scale trial casting should be made.

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.

Casting Thickness & Cure Time - The cure time and ultimate shrinkage of all Crystal Clear EU products will vary depending on mass concentration, thickness of the casting, mold configuration, etc. For example, a 200 gram mass of Crystal Clear 220 EU will cure faster if left to cure in a conical vessel (cup) versus a casting dispersed as a thin sheet measuring 3 centimeters square by 1 mm thick. This is due to the heat generated by the concentration of material in the cup versus heat that is dissipated from the sheet casting. Castings will resist yellowing when exposed to UV, but may darken over time.

- **Crystal Clear 220 EU** can be cast ½" -3" (1.25 cm -7.5 cm) thick.
- **Crystal Clear 221 EU** can be cast greater than 3" (7.5 cm) thick. Crystal Clear 221 EU is a slower resin vs Crystal Clear 220 EU and is intended for making large mass castings.

Adding Color Pigments to Crystal Clear EU Resins - it is very easy to add varying degrees of color to Crystal Clear™ EU 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 EU 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 at room temperature (73°F/23°C). Premix each component seperately before dispensing.

Measuring - Crystal Clear 220 EU & 221 EU have a mix ratio of 100A:75B by weight. You must use an accurate digital gram scale to weigh Parts A and B properly. **Do not use an 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 EU, 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. Your vacuum pump must pull a minimum of 29 inches of mercury (or 1 Bar / 100 KPa). Leave enough room in container for material expansion. Vacuum material until it rises, breaks and falls. Vacuum for 1 minute after material falls.

POURING, CURING & PERFORMANCE...

Pouring:

If casting Crystal Clear™ EU 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 when pouring Crystal Clear EU™ into a mold: pre-heating the mold is recommended. As a starting point, heat the mold to 150–200°F (66–93°C) for a minimum of 4 hours. Adjust time and temperature as needed based on mold material, casting type, and mold configuration. This will minimize chances of fish-eyeing, suck back, corner rounding, large bubbles, etc. in finished casting. See FAQ for Crystal Clear EU for more information.

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^2) 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 is loaded with information about mold making, casting and more.