

## Appendix I

### Datasheet of Urethane Rubber

# Clear Flex™ Series

## Water Clear Urethane Rubber



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### PRODUCT OVERVIEW

**Clear Flex™ 50** and **Clear Flex™ 95** are water white clear urethane liquid rubber compounds designed for applications that require absolute clarity and resistance to sunlight. Low viscosity ensures easy mixing and pouring. **Clear Flex™ 50 and 95** cure at room temperature with negligible shrinkage. Cured castings are clear, flexible and UV Resistant. Vibrant colors and color effects are achieved by adding pigments. Applications include making clear-cut molds, model reproductions, decorative cast pieces, special effects, prototype parts.

**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

\* Values measured at room temperature (73°F/23°C)

	A:B Mix Ratio by Weight	Mixed Viscosity (ASTM D-2393)	Pot Life (ASTM D-2471)	Cure Time	Shore A Hardness (ASTM D-2240)	Specific Gravity (g/cc) (ASTM D-1475)	Specific Volume	Die C Tear Strength (ASTM D-624)	Tensile Strength (ASTM D-412)	Shrinkage (in./in.)	Elongation at Break % (ASTM D-412)	Color
Clear Flex™ 50	1:2 pbw	250 cps	25 min.	16 hrs.	50A	1.04	26.8	25 pli	250 psi	0.0015	500%	Clear
Clear Flex™ 95	1:1.5 pbw	250 cps	25 min.	16 hrs.	95A	1.04	26.8	200 pli	2,500 psi	0.0028	175%	Clear

#### INDEX OF REFRACTION

Clear Flex™ 50: 1.48822 at 20°C / 1.48649 at 25°C

Clear Flex™ 95: 1.49317 at 20°C / 1.49151 at 25°C

#### ELECTRICAL PROPERTIES

Volume Resistance (ohm); >7.646E+13 (ASTM D-150-98)

Volume Resistivity (ohm cm); >6.014E+15 (ASTM D-150-98)

Dielectric Constant k' @100 Hz; 6.62 (ASTM D-150-98)

Dissipation Factor @ 100Hz; 0.103 (ASTM D-150-98)

Dielectric Strength (V/mil); 474 (ASTM D-147-97a)

### PROCESSING RECOMMENDATIONS

**PREPARATION...** This product has a limited shelf life and should be used as soon as possible. Materials should be stored and used in a warm environment (73°F/23°C). All liquid urethanes will react with moisture in the air, causing bubbles. Use in a low humidity environment (below 50% RH). Mixing tools and containers should be clean and made of metal or plastic. 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. 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.

**Applying a Sealing and Release Agent** – Clear Flex™ rubber will bond when poured over many surfaces. Porous surfaces like plasters, wood, concrete, etc. require a sealing agent (such as SuperSeal™) followed by a release agent (such as Universal™ Mold Release Agent).

**Non-Porous Surfaces** - Metal, glass, hard plastics, sulfur free clays, etc. require only Universal™ Mold Release.

**Modelling Clays** – Apply high quality, fast evaporating spray shellac followed by Universal™ Mold Release.

**If Pouring Clear Flex™ Into a Rubber Mold** – Clear Flex™ is not compatible with all rubber mold materials and may not cure. Use only Mold Max™ tin cure silicones or Mold Star™ 15, 16 or 30 platinum-cure silicones. Vytaflex™ urethane rubbers can also be used – release agent required.

**If Using Mold Max™ Silicones** - To prevent cure inhibition, post-cure newly made silicone mold for 8 hours at 60°C/150°F and let cool before pouring Clear Flex™ Rubber into mold.

**For Best Results Before Pouring Clear Flex™ Into Mold:** Pre-heat rubber mold at 212°F/100°C for 4 hours. This will minimize chances of fish-eyeing, suck back, corner rounding, large bubbles, etc. in finished casting.

**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.

## MEASURING & MIXING...

**Stir or shake Part B thoroughly before dispensing.** Before you begin, pre-mix Part B thoroughly to re-disperse pigments that may have settled. **Using a gram scale**, dispense required amounts of parts A and B into a mixing container and mix for 3 minutes. Scrape the sides and bottom of the container several times.

**If Mixing Large Quantities** (16 lbs./7 kg. or more) at one time, use a mechanical mixer (i.e. turbine mixer or equal) for 3 minutes followed by careful hand mixing for one minute as directed above. Then, pour entire quantity into a new, clean mixing container and do it all over again. If coloring or filling Clear Flex™ 50 or Clear Flex™ 95, add filler or pigment dispersion to Part B and mix thoroughly before adding Part A.

**Important:** Material is mass sensitive and will exotherm. Large amounts of material cast at one time will generate heat and will shrink in proportion to mass. The more material cast in a large concentration, the higher the shrinkage. Amount and nature of shrinkage will depend on casting thickness and mold configuration.

**Vacuuming Material** - If 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 Clear Flex™ 50 or Clear Flex™ 95 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** - Best results are obtained using a pressure casting technique. 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 two hours.

**Post Curing** - Castings will cure faster and achieve maximum physical properties and heat resistance if Clear Flex™ 50 or Clear Flex™ 95 is post cured. Post curing is recommended if castings are thin or low mass concentration. Castings should be post cured in a mold or support structure.

**Post Cure Schedule:** Allow the material to cure for 6–8 hours at room temperature followed by 16 hours at 150°–160°F (65°–72°C). Allow casting or part to cool to room temperature before demolding.

For most applications, room temperature curing (73°F/23°C) for 24–48 hours is adequate. Castings will reach ultimate physical properties at room temperature in 5–7 days. Castings removed from mold before 12 hours may exhibit a tacky surface that can be eliminated by exposing casting to 150°F/65°C for 4–6 hours. If you are pouring less than 1/4 in. / 0.64 cm. of material, the casting should be heat post cured.

**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.**



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

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

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