

Poly-Optic® 14 Series Casting Resins

Low Viscosity, Polyurethane Casting Resins—Clear Like Water

Poly-Optic® 14 Series Casting Resins are two-part, polyurethane systems that were formulated specifically for applications where optical clarity is a must. Use Poly-Optic plastics for casting decorative objects, production parts, models and more. Castings are clear like water; however, PolyColor dyes can be added to obtain clear, colored castings. Poly-Optic systems, with their low viscosities and long pot-lives, provide for easy mixing, excellent detail penetration and easy degassing resulting in bubble-free castings when vacuum or pressure casting techniques are employed.

Poly-Optic® 1410 cures to a hard plastic that is virtually unbreakable. Cure 1410 at room temperature and, for optimum physical properties, post cure at 150°F.

Poly-Optic® 1411 is an easy 1A:1B, by volume, system that cures quickly to a super-strong, hard plastic. Poly-Optic 1411 develops hardness and can be demolded more quickly than 1410. It also has a higher heat deflection temperature, which is useful in certain prototyping applications.

Poly-Optic® 1420 cures to a tough, impact- and heat-resistant plastic that can be polished and machined. For strong plastic, heat cure 1420 at 150-180°F. For brittle, glass-like castings, cure at room temperature.

Poly-Optic® 14-70 is a firm rubber. Blend 1410 and 14-70 to achieve any hardness between Shore D85 and Shore A70.

MOLD PREPARATION: Poly-Optic products reproduce minute detail from a mold or pattern, but may stick or foam when poured on improperly prepared surfaces. A trial casting on a surface finish similar to the final mold should be made to avoid damaging a valuable mold. Polyethylene and silicone rubber molds, such as PlatSil® 71 and 73 Series products, do not require a release agent. [CAUTION: Condensation-cure silicones (i.e., TinSil® 70 Series) are not recommended for casting Poly-Optic since residual alcohol may inhibit the cure or result in hazy castings.] Latex, polyurethane or metal molds must be dry and require a coat of a suitable release agent, such as Pol-Ease® 2300 Release Agent. For optically clear castings, use highly polished masters to create molds with excellent surface quality.

FEATURES

- Crystal clear
- Reproduces fine detail
 - Can be machined, drilled and sanded
 - Tough and hard, but not brittle
 - Long working time
 - Low shrinkage upon cure

MIXING: Before mixing resins, be sure that both Parts A and B are at room temperature and that all tools and molds are ready to go! Use metal or plastic mixing vessels (i.e., polyethylene pail) and spatulas to avoid introducing moisture. **Shake or stir Part B before use.** Carefully weigh or measure proper ratios of A and B into a mixing container. Mix immediately, thoroughly scraping sides and bottom. Vacuum degas mix. Pour mix into mold as quickly as possible. Pressure casting helps produce clear castings. A light spray of Pol-Ease 2300 Release Agent or quickly passing the flame of a torch over the back of the casting helps to break bubbles on the back of the pour. For bubble-free castings, vacuum degassing or pressure casting is necessary.

Once the containers of Parts A and B are opened, use the product completely or reseal tightly as atmospheric moisture contamination may cause foaming of the plastic. To lengthen shelf life, spray Poly Purge, a heavier-than-air dry gas, into the open containers before resealing. If containers collapse slightly over time, reopen containers and spray more Poly Purge to keep containers from further collapse.

CURING: Allow castings to remain in the mold until thoroughly cured. Parts demolded too soon may be subject to deformation. Use pre-warmed molds to hasten curing. Low temperatures slow the cure and extend demold time.

Poly-Optic 1410, 1411 and 14-70 cure at room temperature. For plastic castings less than ¼-inch thick, 1411 is recommended because it can be demolded more quickly in thin sections. For

PHYSICAL PROPERTIES

Poly-Optic® Product	1410	1411	1420	14-70
Mix Ratio	3A:2B, by weight	1A:1B, by volume	2A:1B, by weight	4A:5B, by weight
Hardness (Shore A or D)	D80	D80	D85	A70
Pour time (min), 2-lb mix	15	9	15	15
Maximum exotherm, 2-lb mass	265°F (129°C)	228°F (109°C)	311°F (155°C)	190°F (88°C)
Demold time (hr)*	2 (1-in thick)*	0.5 (½-in thick)	8 @ 150°F/0.5 @ 175°F	24-48
Specific gravity	1.07	1.07	1.05	1.06
Viscosity, 2 min after mixed (cP)	700	600	250	340
Specific Volume, in³/lb	27.5	27.5	27.5	27.5

* Demold time varies with thickness of casting and the amount of Part 14X Catalyst added.

thinner castings, or when using Poly-Optic 1410 for thin parts, add Part 14X Catalyst or heat cure (8 hr at 140-150°F). Castings greater than ½-in thick do not require heat or 14X, but the addition or use of either will speed up the curing process considerably.

Poly-Optic 1420 cures in 8 hours at 150°F, or 16 hours for optimum physical properties. If cured at a higher temperatures, parts may be demolded sooner (e.g., 30 min at 180°F depending on size). For brittle, glass-like parts, cure 1420 at room temperature.

Wash mold release from surfaces prior to painting or bonding.

ACCELERATING CURE SPEED: Poly-Optic 14X Catalyst can be mixed into Part B prior to adding Part A to accelerate gel and cure times. For castings less than ½-in thick, 14X is recommended. Add 0.5% 14X to the total mix weight to speed the cure significantly (e.g, 0.5g 14X in a 100g mix of 1410 halves the pour and cure time). Exotherm (heat of reaction) and thus shrinkage on cooling is also increased. Experiment to determine the best amount of 14X to use, but do not use more than 1% 14X because final physical properties may be affected.

RETARDING CURE SPEED: Poly-Optic 14R Retarder slows the cure of Poly-Optic systems. Slowing the cure also reduces exothermic heating, which can cause distortion, waviness and shrinkage especially in castings >½-inch thick. For every part of 14R added, an equal part of Part A must be added to the mix. Add 1.5% 14R to the total mix weight of 1410 to increase the pot-life from 15 to 70 minutes. Add 1% 14R to 1411 to double the working time from 9 to 18 minutes. Depending on the size and mass of the part, post curing 14-70 and 1410 parts in the mold at >140°F for 12 to 16 hours may be necessary. The extended pot-life creates a lower exotherm upon curing, allowing larger castings to be made without distortion. Never use more than 4% 14 R since the system may not cure properly.

COLORS: Add PolyColors to 14 Series Part B before mixing with Part A to create clear plastics of any color.

EXTERIOR USES: Although Poly-Optic 1410, 1411 and 1420 are non-yellowing formulas, they are not recommended for long-term exterior use. Poly UV Additive can be added to improve durability for exterior applications. Add 1% UV Additive to the total mix weight of Poly-Optic to reduce the onset of chalking and

ACCESSORIES	
Poly-Optic® 14X Catalyst	1 oz, 1 pt (1 lb)
Poly-Optic® 14R Retarder	1 pt (1 lb)
Poly UV Additive	4 oz, 1 pt (1 lb)
Pol-Ease® 2300 Release Agent	12-oz can, case of 12 cans
Pol-Ease® 2500 Release Agent (Cleanable/Paintable)	13-oz can, case of 12 cans
Poly Purge™	10-oz can, case of 12 cans
PolyColors (Red, Green, Yellow, Blue, Brown & Black)	4-oz bottle (0.25 lb), 1 pint (1.0 lb)

PACKAGING	
Product	Unit Weight (lb)
Poly-Optic® 1410 Mix Ratio 3A:2B	10.0 60.0
Poly-Optic® 1411 Mix Ratio 1A:1B (By Volume)	3.8 15.2 76
Poly-Optic® 1420 Mix Ratio 2A:1B	6.0 24.0 120.0
Poly-Optic® 14-70 Mix Ratio 4A:5B	14.4 72.0

pitting of the outside surface for ~2 years. Add 3% Poly UV Additive to achieve good exterior stability beyond 5 years.

CLEAN UP: Tools should be wiped clean before the plastic is hard. Denatured ethanol is a good cleaning solvent, but it must be handled with extreme caution owing to its flammability and health hazards. Work surfaces can be waxed or coated with Pol-Ease 2300 Release Agent so cured rubber can be removed.

SAFETY: Before use, read product labels and Material Safety Data Sheets. Follow safety precautions and directions. Contact with uncured products may cause eye, skin and respiratory irritation and dermal and/or respiratory sensitization. Avoid contact with skin and eyes. If skin contact occurs, remove with waterless hand cleaner or alcohol then soap and water. In case of eye contact, flush with water for 15 minutes and call physician. Use only with adequate ventilation. Poly-Optic plastics are not to be used where food or body contact may occur. Poly-Optic plastics burn readily when ignited. Care should be taken with sanding dust and other easily ignitable forms of these products.

STORAGE LIFE: Poly-Optic liquids can be stored for at least 6 months in unopened containers stored at room temperature. Poly-Optic Part As may crystallize slightly or become viscous during storage. If crystallization occurs warm the container to 100-120°F until crystals dissipate. Cool to room temperature before use.

DISCLAIMER: The information in this bulletin and otherwise provided by Polytek® is considered accurate. However, no warranty is expressed or implied regarding the accuracy of the data, the results to be obtained by the use thereof, or that any such use will not infringe any patent. Before using, the user shall determine the suitability of the product for the intended use and user assumes all risk and liability whatsoever in connection therewith.

Physical Properties of Polytek Poly-Optic® 14 Series Liquid Plastics

Poly-Optic® Product/ Property	1410	1411	1412	1420	14-70
Mix Ratio, By Weight (By Volume)	3A:2B	100A:90B (1A:1B)	1A:1B (1A:1B)	2A:1B	4A:5B
Part A Color	Water Clear	Water Clear	Water Clear	Water Clear	Water Clear
Part B Color	Water Clear	Water Clear	Water Clear	Water Clear	Water Clear
Mix Viscosity (cps)	700	600	750	250	340
Pot Life (min)	15	9	8	15	15
Maximum Exotherm, °F(°C)	265 (129)	228 (109)	235 (113)	311 (155)	190 (88)
Demold Time (hr)	2 (1-inch thick)	0.5 (½-inch thick)	0.5 @ 175°F (80°C)	8 @ 150°F (65°C) 0.5 @ 175°F (80°C)	24-48
Total Cure Time (days)	7	7	16 hr @ 175°F (80°C)	See Above	7
Linear Shrinkage	*	*	*	*	*
Specific Gravity	1.07	1.07	1.07	1.05	1.06
Shore Hardness	D80	D80	D80	D85	A70
Tensile Strength, psi (MPa)	4,566 (31.5) 7,870 (54.3)**	6,083 (42.0) 7,922 (54.6)**	9,825 (67.8)	7,900 (54.5)	564 (3.9)
Elastic Modulus, psi (MPa)	96,830 (667.8) 127,474 (858.4)**	133,956 (923.8) 145,785 (1,005.4)**	179,886, (1,240.6)	171,500 (1,182.7)	85 (14.9) Die B Tear Strength, pli
Flexural Strength, 5% Strain, psi (MPa)	4,893 (33.7) 10,636 (73.4)**	8,478 (58.5) 10,829 (74.7)**	12,261 (84.6)	12,600 (86.9)	NA
Flexural Modulus, psi (MPa)	144,158 (994.2) 241,450 (1,665.2)**	250,992 (1,730.9) 270,545 (1,865.8)**	295,101 (2035.1)	250,000 (1,724.1)	NA
Heat Deflection Temperature, °F (°C)	100 (38) 149 (65)**	138 (58) 187 (86)**	227 (109)	168 (75)	NA
% Elongation	27.0 12.0**	7.0 9.8**	11.1	5.3	234.0

* Shrinkage is primarily caused by gelling while hot then cooling. Parts that cure with minimal temperature rise exhibit minimal shrinkage.

** Post cured for 16 hours at 160°F (70°C)

Conventions:

psi/145 = MPa (megapascals)

pli x .1751 = kN/m (kilonewtons per meter)

NA = Not Applicable

Disclaimer: The information in this bulletin and otherwise provided by Polytek is considered accurate. However, no warranty is expressed or implied regarding the accuracy of the data, the results to be obtained by the use thereof, or that any such use will not infringe any patent. The user shall determine the suitability of the product for the intended use and assumes all risk and liability whatsoever in connection therewith.