



CPD

Infusion Products Guide

Considerations when Selecting an Epoxy Resin System for Infusion

For more detail, see our **Epoxy Selection Guide for Infusion**

Find it at [Polytek.com/resources/brochures](https://polytek.com/resources/brochures)

Various options need to be weighed when selecting an epoxy resin system for the infusion process. The considerations that need to be made fall into two categories:

- End-Product Requirements
- Processing Requirements

A. End-Product Requirements

End-Product requirements are those that apply to the function and/or use of the finished composite part or structure.

Operating Temperature

The operating temperature or service temperature of the article to be manufactured is paramount to the selection of an epoxy resin system. The heat deflection temperature (HDT) of the system selected must be greater than or equal to this intended operating temperature.

Other Physical Properties

Other physical properties such as the desired compressive flexural and tensile strengths should be considered when selecting an epoxy resin system for infusion. Please refer to the physical properties listed in the lower half of Tables 1, 2 and 3 to determine if one of the CPD infusion systems meets your end-product requirements. If one of these systems does not meet your end-product requirements, CPD can custom tailor an epoxy resin system to meet your needs.

B. Process Requirements

There are five main process requirements to the act of manufacturing a composite part or structure.

1. Cure Cycle

The first process requirement that should be considered when selecting an epoxy resin system for infusion is the desired cure cycle. Please review the capabilities of your equipment, tooling and ancillary materials when choosing a cure cycle. Please also consider the temperature your mold must withstand.

2. Post Cure Cycle

Not all epoxy resin systems require a post cure. However, it is typically the case with epoxy that a post cure is required to develop ultimate properties.

3. Viscosity

CPD offers a variety of low viscosity resins that have been formulated specifically for infusion. One advantage of using epoxy versus other organic polymers is that epoxy resin systems exhibit a latent built in viscosity. That is, they typically remain low in viscosity much longer than other organic polymers - extending the work life without compromising gel time.

4. Work Life

The work life required to infuse a composite part or structure should also be considered when selecting an epoxy resin system for infusion. Because work life varies with mass and temperature, CPD does not report the work life of the epoxy resin systems it manufactures. Rather, CPD reports the gel time of each of its resin systems in a 150-gram mass at 77°F (25°C).

5. Demold Time

Demold time is the point at which the resin system has cured to a degree that a composite part or structure is strong enough to be removed from the mold. In many cases, a composite part or structure will be removed from the mold following the supported stage of a post cure cycle and, in others, it will be removed from the mold after a satisfactory time at room temperature.

Table 1: CPD Room Temperature Infusion Systems

Room Temperature Systems	3621A/3821B	4281A/4284B	2110A/9260B	4281A/4286B	4281A/9265B	2110A/9297B
Elevated Temperature Cure Required in Mold ¹	No	No	No	No	No	No
Post Cure Required ¹	No	No	No	No	No	No
Post Cure Recommended ¹	Yes	Yes	Yes	Yes	Yes	Yes
Handling Properties						
Resin Viscosity at 77°F, cps	1,300	900	1,200	900	900	1,200
Hardener Viscosity at 77°F, cps	70	8	30	12	30	30
Mixed Viscosity at 77°F, cps	300	150	300	220	280	300
Mix Ratio By Weight	100A:30B	100A:22B	100A:28B	100A:22B	100A:27B	100A:26B
Mix Ratio by Volume	100A:36B	100A:27B	3A:1B	100A:27B	3A:1B	3.1A:1B
Gel Time at 77°F, 150g, min.	30	40	50	70	105	290
Physical Properties						
Color	Amber	Amber	Straw Yellow	Amber	Amber	Amber
Shore Hardness	84D	86D	84D	86D	87D	87D
Tensile Strength, psi	9,700	10,300	10,800	12,500	11,100	10,700
Tensile Modulus, psi	415,000	348,000	425,000	529,000	456,000	458,000
Tensile Elongation, %	7.4	5.9	7.2	4.3	8.8	8.8
Compressive Strength, psi	14,500	18,800	14,200	15,800	13,900	12,900
Flexural Strength, psi	15,300	15,400	18,400	20,500	18,700	17,300
Flexural Modulus, psi	460,000	413,000	479,000	437,000	409,000	397,000
HDT, Post Cured, °F	185	180	200	210	201	210
Izod Impact, Notched, ft-lb/in	1.07	1.16	1.12	1.15	1.15	1.27
Shrinkage, in/in	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

¹ Tooling must be able to withstand the temperatures it will be exposed to during the cure cycle and the supported stage(s) of a post cure

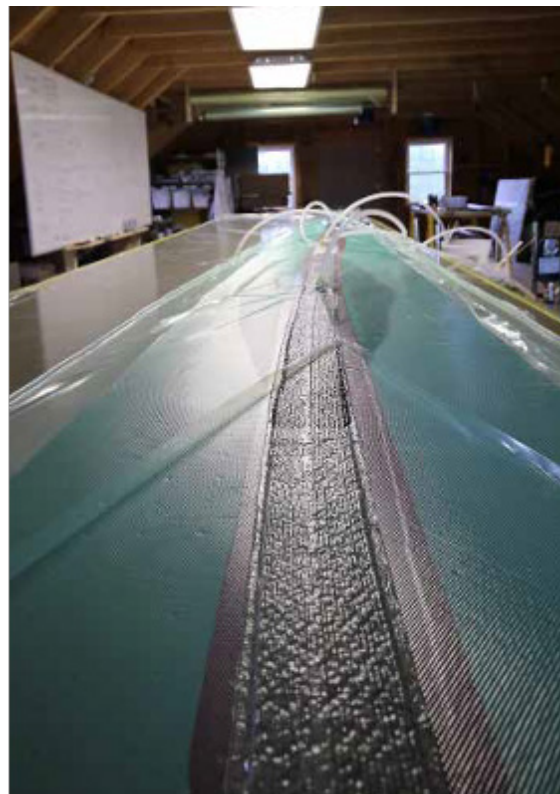


Table 2: CPD Medium Temperature Infusion Systems

Medium Temperature Systems	4310A/9239B	4310A/9234B	4281A/9235B	4310A/9231B
Elevated Temperature Cure Required in Mold ¹	Yes	Yes	Yes	Yes
Post Cure Required ¹	Yes	Yes	Yes	Yes
Post Cure Recommended ¹	Yes	Yes	Yes	Yes
Handling Properties				
Resin Viscosity at 77°F, cps	1,200	1,200	900	1,200
Hardener Viscosity at 77°F, cps	15	15	20	100
Mixed Viscosity at 77°F, cps	400-600	400-600	330	500-700
Mixed Viscosity at 100°F, cps	200-300	200-300		250-350
Mix Ratio by Weight	100A:20B	100A:25B	100A:27B	100A:35B
Mix Ratio by Volume	4A:1B	3.2A:1B	3A:1B	2.33A:1B
Gel Time at 77°F, 150g, min.	60	110	145	500
Gel Time at 100°F, 150g, min.	25	40		180
Minimum Recommended Cure Temperature ² (In Mold)	150°F	120°F	120°F	150°F
Physical Properties				
Color	Amber	Amber	Clear Amber	Amber
Shore Hardness	85D	87D	86D	89D
Tensile Strength, psi	11,800	12,600	11,200	7,100
Tensile Modulus, psi	424,000	419,000	421,000	367,000
Tensile Elongation, %	4.6	4.1	5.6	2.5
Compressive Strength, psi	15,800	16,700	15,900	13,500
Flexural Strength, psi	17,200	19,500	18,900	14,100
Flexural Modulus, psi	446,000	454,000	438,000	411,000
HDT, Post Cured, °F	259	312	274	310
Izod Impact, Notches, ft-lb/in	1.22	0.76	1.15	0.78
Shrinkage, in/in	<0.002	<0.001	<0.002	<0.001

¹ Tooling must be able to withstand the temperatures it will be exposed to during the cure cycle and the supported stage(s) of a post cure cycle.

² A post cure at temperatures in excess of the minimum recommended cure temperature is required to develop ultimate properties



Table 3: CPD High Temperature Infusion Systems

High Temperature Systems	4310A/9232B	4303A/4303B	4307A/4303B	2134A/4307B	2135A/9529B	4305
Elevated Temperature Cure Required in Mold ¹	Yes	Yes	Yes	Yes	Yes	Yes
Post Cure Required ¹	Yes	Yes	Yes	Yes	Yes	Yes
Post Cure Recommended ¹	Yes	Yes	Yes	Yes	Yes	Yes
Notes		Anhydride Cure, Toughened	Anhydride Cure, Toughened	Novolated, Chemically resistant	Novolated, Chemically resistant	One component system
Handling Properties						
Resin Viscosity at 77°F, cps	1,200	1,800	3,500	7,500	7,700	NA
Hardener Viscosity at 77°F, cps	40	200	200	200	2,800	NA
Mixed Viscosity at 77°F, cps	620	750	1,800	1,800	5,500	5,700
Mixed Viscosity at 100°F, cps	340	NA	NA	860	1,700	2,900
Mixed Viscosity at 120°F, cps	NA	200	500	380	600	500
Mixed Viscosity at 140°F, cps	NA	100	250	270	320	200
Mix Ratio by Weight	100A:20B	100A:107B	100A:88B	100A:90B	100A:6B	NA
Mix Ratio by Volume	4A:1B	100A:103B	100A:82B	100A:89B	13.8A:1B	NA
Gel Time at 77°F, 150g, min.	75	NA	NA	1,440	720	NA
Gel Time at 100°F, 150g, min.	35	NA	NA	NA	240	NA
Gel Time at 120°F, 150g, min.	NA	>180	>180	360	90	>480
Gel Time at 140°F, 150g, min.	NA	>120	>120	NA	45	>240
Gel Time at 170°F, 150g, min.	NA	120-240	120-240	NA	NA	NA
Minimum Recommended Cure temperature ² (In Mold)	150°F	170°F	170°F	160°F	150°F	250°F
Physical Properties						
Color	Brown	Brown	Brown	Dark Amber	Dark Amber	Amber
Shore Hardness	88D	87D	87D	90D	92D	87D
Tensile Strength, psi	12,900	12,100	10,500	12,200	10,200	8,600
Tensile Modulus, psi	431,000	486,000	451,000	472,000	470,000	527,000
Tensile Elongation, %	3.1	2.4	2.5	2.3	2.8	2.1
Compressive Strength, psi	16,900	25,600	14,700	21,300	27,100	NA
Flexural Strength, psi	17,900	20,500	15,300	17,900	15,600	NA
Flexural Modulus, psi	448,000	536,000	354,000	488,000	485,000	NA
HDT, Post Cured, °F	356	375	375	385	450	425
Izod Impact, Notched, ft-lb/in	1.23	1.01	1.06	1.01	1.06	NA
Fracture Toughness, KIC, MPa*m ^{1/2}	NA	NA	1.02	NA	NA	NA
Strain Energy Release Rate, GIC, KJ/m ²	NA	NA	0.70	NA	NA	NA
Shrinkage, in/in	<0.001	<0.005	<0.005	<0.002	<0.003	<0.002

¹ Tooling must be able to withstand the temperatures it will be exposed to during the cure cycle and the supported stage(s) of a post cure cycle.

² A post cure at temperatures in excess of the minimum recommended cure temperature is required to develop ultimate properties

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The expertise of CPD in epoxy and polyurethane formulations for a variety of markets adds significant value to the Polytek portfolio of products. In addition, the customer-centric culture and technical expertise of CPD aligns with Polytek's mission to facilitate the success of our customers.

This brochure represents a sampling of our most popular Infusion Products. If you do not see exactly what you are looking for, please call us and we can help you find the right products for your application.

About Polytek

Started in 1984, Polytek Development Corporation is a leading manufacturer of specialty polymers including polyurethane elastomers, casting resins, silicones, epoxies, and latex systems.

Polytek's collective mission is to design and manufacture the highest-performance line of liquid rubbers and related casting products as well as to provide our customers with unmatched, industry-setting technical support and customer service. In doing so, we are committed to helping our customers realize the greatest value from the use of our products and our resources.

In the end, our success is defined by yours.



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