



Engineered Systems
for
Composite Fabrication

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Hand Lay-Up Laminating Systems

The laminating systems from Composite Polymer Design are designed for use in wet lay-up, filament winding, and RTM applications as well as cast parts. The systems exhibit excellent wet-out on all reinforcements such as fiber glass, carbon, and hybrid fibers and can be used with all types of cores. The adhesion capabilities of the systems provide excellent bonding to all surfaces. The systems can also be filled with standard glass balloons, flux, glass fibers, and other fillers for filleting and patching.

The systems consist of formulated epoxy resins and hardeners with varying cure speeds. The 9263B, 9283B, and 9287B hardeners are interchangeable and may be combined for custom property requirements. Many of the systems have been engineered to have convenient volumetric ratios so that they may be used on all types of metering and meter mix devices. While cure is complete after 7 days at room temperature, properties are increased with a moderate post cure. These formulations are NON BLUSHING, assuring maximum performance in the harsh environments present in the marine industry. The high crosslink density and the excellent heat deflection temperatures assure protection from print through problems, giving flexibility in color choices for parts made from this CPD system. 2117A resin may be substituted for 2127A resin where a medium viscosity thixotropic material is required to minimize drainage. The 2117A resin will alter the viscosity of the system to enhance performance on vertical surfaces.

Table 1 – Laminating System Handling and Physical Properties

System	2127A 9263B	2127A 9283B	2127A 9287B	2117A 9263B	2117A 9283B	2117A 9287B
Handling Properties						
Resin Viscosity, 77°F, cps	5,000	5,000	5,000	6,000	6,000	6,000
Hardener Viscosity 77°F, cps	50	30	15	50	30	15
Mixed Viscosity, 77°F, cps	900	600	350	2,250	1,500	950
Mix Ratio By Weight	100A:33B	100A:33B	100A:33B	100A:33B	100A:33B	100A:33B
Mix Ratio By Volume	3A:1B	3A:1B	3A:1B	3A:1B	3A:1B	3A:1B
Gel Time, 77°F, 150g, min.	30	180	600	30	180	600
Physical Properties						
Shore Hardness	81D	81D	80D	81D	81D	83D
Tensile Strength, psi	11,900	11,200	9,800	11,900	11,600	9,900
Tensile Elongation, %	3.2	3.9	6.9	3.2	3.9	6.9
Compressive Strength, psi	21,900	19,600	25,000	21,900	19,600	25,000
Flexural Strength, psi	14,700	16,800	15,700	14,700	16,800	15,700
Flexural Modulus, psi	542,000	479,000	459,000	542,000	516,000	511,000
HDT, Room Temp. Cure, °F	135	140	135	135	140	135
HDT, Post Cure, °F	180	180	180	180	180	180
Izod Impact, Notched, ft-lb/in	1.28	1.22	1.05	1.22	1.24	1.05
Shrinkage, in/in	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Hardener Blend Combinations

The hardeners can be used as they are packaged or in some combination to achieve a specific pot life. Some of the most common combinations are as follows:

Table 2 – 2127A Resin with 9283B and 9287B Hardeners

Hardener Blend Combination Chart		
% 9283B	% 9287B	Pot life, 77°F, min.
100	0	120
90	10	138
80	20	156
70	30	174
60	40	192
50	50	210
40	60	228
20	80	264
10	90	282
0	100	300
Mix Ratio By Weight 100A:33B		Mix Ratio By Volume 3A:1B
Pot Life: Time to 10,000 cps		

Table 3 – 2127A Resin with 9263B and 9287B Hardeners

Hardener Blend Combination Chart		
% 9263B	% 9287B	Pot life, 77°F, min.
100	0	30
90	10	57
80	20	84
70	30	111
60	40	138
50	50	165
40	60	192
30	70	219
20	80	246
10	90	273
0	100	300
Mix Ratio By Weight 100A:33B		Mix Ratio By Volume 3A:1B
Pot Life: Time to 10,000 cps		

Table 4 – 2127A Resin with 9263B and 9283B Hardeners

Hardener Blend Combination Chart		
% 9263B	% 9283B	Pot life, 77°F, min.
100	0	30
90	10	39
80	20	48
70	30	57
60	40	66
50	50	75
40	60	84
30	70	93
20	80	102
10	90	111
0	100	120
Mix Ratio By Weight 100A:33B		Mix Ratio By Volume 3A:1B
Pot Life: Time to 10,000 cps		

Temperature and Pot Life

Desired pot life is dictated by both process requirements and temperature of the environment in which the laminate is being constructed. Environmental temperature has a significant impact on the difference between the literature pot life value and the pot life that will actually be obtained. The pot life is measured according to SPIR-ERF 13-70 (METHOD A-1) measured at 77°F. The impact of temperature on pot life is charted in Figure 1.

Figure 1 - Pot Life Variation

Pot Life Variation										
°C	°F	20	30	60	80	120	160	200	240	300
		Min	Min	Min	Min	Min	Min	Min	Min	Min
35	95.0	10	15	30	40	60	80	100	120	150
34	93.2	11	16.5	33	44	66	88	110	132	165
33	91.4	12	18	36	48	72	96	120	144	180
32	89.6	13	19.5	39	52	78	104	130	156	195
31	87.8	14	21	42	56	84	112	140	168	210
30	86.0	15	22.5	45	60	90	120	150	180	225
29	84.2	16	24	48	64	96	128	160	192	240
28	82.4	17	25.5	51	68	102	136	170	204	255
27	80.6	18	27	54	72	108	144	180	216	270
26	78.8	19	28.5	57	76	114	152	190	228	285
25	77.0	20	30	60	80	120	160	200	240	300
24	75.2	22	33	66	88	132	176	220	264	330
23	73.4	24	36	72	96	144	192	240	288	360
22	71.6	26	39	78	104	156	208	260	312	390
21	69.8	28	42	84	112	168	224	280	336	420
20	68.0	30	45	90	120	180	240	300	360	450
19	66.2	32	48	96	128	192	256	320	384	480
18	64.4	34	51	102	136	204	272	340	408	510
17	62.6	36	54	108	144	216	288	360	432	540
16	60.8	38	57	114	152	228	304	380	456	570
15	59.0	40	60	120	160	240	320	400	480	600

Processing Options

The laminating systems from CPD have been designed for use in all standard wet lay-up processes including roller applications, squeegee, impregnating equipment, both automatic metering and manual. The resin to reinforcement ratio can be controlled due to the excellent wetting characteristics of the system that does not require overcoat of the resin matrix.

Core Bonding 9508A and 9511A

9508A and 9511A flow coat systems have been designed to be chemically compatible with the hand lay-up laminating systems. These are short pot life systems used for bonding a wide range of materials where a thixotropic paste is required.

Table 5 - 9508A and 9511A Resins with 9261B Hardener

Core Bonding Handling and Physical Properties		
System	9508A/9261B	9511A/9261B
Handling Properties		
Mixed Viscosity, 77°F, cps	High Build Paste	Low Build Paste
Mix Ratio By Weight	100A:25B	100A:33B
Mix Ratio By Volume	3.4A:1B	3A:1B
Gel Time , 77°F, 150g, min.	17	25
Physical Properties		
Color	Tan	Milky
Shore Hardness	81D	81D
Tensile Strength, psi	11,200	11,200
Compressive Strength, psi	14,400	14,400
Flexural Strength, psi	16,600	16,600
HDT, Room Temp. Cure, °F	140	140
HDT, Post Cure, °F	205	205
Izod Impact, Notched, ft-lb/in	0.99	0.99
Shrinkage, in/in	<0.003	<0.003

Specialty Systems

- Custom formulated room temp curing laminating systems with varied post cure properties
- High temp systems for properties up to 450°F
- Long pot life wet-preg systems
- High peel strength bonding systems
- RTM systems
- Press molding systems
- Specialty hardener bonding systems
- Epoxy casting systems
- Polyurethane casting systems
- Custom formulations

Fairing Compounds 9560 and 9558

This system consists of a thixotropic paste developed with excellent impact resistance, adhesion and flexibility. The system cures to a light, easily sandable material that is generally used for cosmetic or surface applications like shaping, filling or fairing on composite materials, metal and most woods.

Table 6 – 9560, 9558-P and 9558-G Compounds

Fairing Compound Handling and Physical Properties			
System	9560	9558-P	9558-G
Handling Properties			
Mix Ratio By Weight	100A:70B	100A:40B	100A:40B
Mix Ratio By Volume	1A:1B	2A:1B	2A:1B
Work Time, 77°F, 1/8", hrs.	2-3	1	1
Physical Properties			
Color	Red-Brown	Red-Brown	White
Shore Hardness	66D	68D	71D
Tensile Strength, psi	3,900	4,300	4,500
Compressive Strength, psi	9,800	7,800	8,300
Flexural Strength, psi	9,400	8,200	8,100
HDT, Room Temp Cure, °F	145	135	135
Izod Impact, Notched, ft-lb/in	0.88	0.96	0.94
CPD-P: Phenolic		CPD-G: Glass	

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