



# PT2050 LAMINATING SYSTEM FOR COMPOSITE PARTS

## DESCRIPTION

PT2050 is a medium viscosity, unfilled, light amber laminating resin that is designed for structural production applications. When used with the four hardeners listed here, the combinations provide excellent wet-out of fiberglass, carbon and aramid fibers. Special additives have been incorporated into these products to promote chemical adhesion to fabrics made with these fibers. Typical applications include aircraft and sail plane skins and structural components, auto bodies, radomes and prototype parts.

Hardeners PT2050-B1 and PT2050-B2 are the standard production hardeners for fabricating composite parts. PT2050-B1 has a one hour working time, and PT2050-B2 has been developed to provide a longer working time for larger and/or more complicated laminates when needed. Both of these hardeners will cure completely at room temperature without additional heat.

PT2050-B is a faster setting hardener that can be used for patching and repairs, and smaller laminates. PT2050-B has a similar viscosity to PT2050-B1 and PT2050-B2, so handling will be similar, except for the faster cure.

PT2050-B3 is a newer addition to our Tooling line that offers some unique characteristics for certain uses. The mixed viscosity of the system when using PT2050-B3 is considerably lower than other laminating hardeners. This allows easy penetration of thicker fabrics during hand lay-up, and provides a good system for the infusion process. Also, even though it has a working time 50% longer than PT2050 Part B1, it cures to a harder state overnight than when using the B1 Hardener. Cured properties with the PT2050-B3 are very similar to the high values obtained with the other Parts B of the PT2050 system.

These products can be considered low toxicity materials that have minimum hazard potential when used properly and in a clean and responsible manner. PT2050 does not contain any hazardous diluents or extenders. Hardeners PT2050-B, PT2050-B1, PT2050-B2 and PT2050-B3 do not contain methylene dianiline (MDA), or other potentially harmful aniline derivatives. Neither the resin or the hardeners will crystallize in normal shipping and storage conditions. Both components have excellent moisture resistance, for minimal problems in high humidity environments.

## PRODUCT SPECIFICATIONS

	PT2050 A	PT2050 B	PT2050 B1	PT2050 B2	PT2050 B3	ASTM Method
Color	Amber	Amber	Amber	Amber	Light Amber	Visual
Viscosity,	1650 cps	200-250 cps	190-200 cps	200-250 cps	35 cps	D2392
Specific Gravity, gms./cc	1.15	1.065	.96	1.0	0.97	D1475
Mix Ratio						
By Weight		100 : 23	100 : 27	100 : 27	100 : 25	PTM&W
By Volume		4 to 1	3 to 1	3 to 1	By Weight	
Pot Life, 4 fl.oz. Mass @ 77°F		18 - 20 min.	60-65 min.	120-140 min.	90 - 95 min.	D2471

## HANDLING and CURING

PT2050-B1 and PT2050-B2 are the hardeners typically used to fabricate high performance composite parts. PT2050-B1 has a one hour working time, and can be used for all sizes of parts using the contact layup method of fabrication. If the vacuum bagging technique is being used, PT2050-B1 should only be used for smaller parts. Hardener PT2050-B2 has a longer working time that is useful for vacuum bagging larger parts before the resin has gelled. In either case, with these hardeners, plan to allow the laminate to cure at least 24 hours, at a minimum of 72°F before moving the structure. This can be accelerated by applying heat after the resin has gelled. Be careful using heat guns and lamps, as they tend to concentrate heat, producing localized hot spots which can damage the epoxy. These systems can be cured at ambient temperatures, or given an elevated temperature cure. The higher the curing temperature is, the higher the resulting service temperature. With a higher temperature cure, a safe service temperature over 200°F can be obtained.

The working time of PT2050-B3 falls between the PT2050 Part B1 and PT2050 Part B2 hardeners, and it can be used for parts somewhat larger than would be produced with PT2050 Part B1. The B3 hardener is unique, in that even though it has a longer working time than the B2 hardener, it gels to a hard state faster than with PT2050 Part B2. The very low mixed viscosity of the PT2050-A/B3 system allows fast wet-out of the reinforcing fabric. This can provide faster layup of larger structures within the hardener's working time, and it makes this system a good candidate for the infusion process of laminate production.

Hardener PT2050-B will cure completely at room temperature, and does not require a heat cure. It is intended for fast repairs or additions to a primary structure, and for parts that will be exposed to lower service temperatures. All primary structures should be fabricated with PT2050-B1, PT2050-B2 or PT2050-B3, to take advantage of their longer work life and better service temperature capabilities.

**TYPICAL MECHANICAL PROPERTIES**

	PT2050 A/B	PT2050 A/B1	PT2050 A/B2	PT2050 A/B3	ASTM Method
Mix Ratio, By Weight By Volume	100 : 23 4 to 1	100 : 27 3 to 1	100 : 27 3 to 1	100 : 25 By Weight	PTM&W
Color	Light Amber	Light Amber	Light Amber	Light Amber	Visual
Mixed Viscosity, centipoise	925 - 975 cps	900 - 950 cps	925 - 975 cps	430 - 450 cps	D2393
Pot Life, 4 fl. Oz. Mass, @77°F	18 - 20 min.	60 - 65 min.	120 - 140 min.	90 - 95 min.	D2471
Cured Hardness, Shore D	86 - 88 Shore D	86 - 88 Shore D	85 - 87 Shore D	85 - 87 Shore D	D2240
Specific Gravity, grams, cc	1.12 - 1.13	1.107 - 1.11	1.11 - 1.115	1.109	D1475
Density, lb./cu. Inch lb. / gallon	.0410 9.47	.0401 9.26	.0402 9.40	.0401 9.25	D792
Specific Volume, cu. in./lb.	24.4	25	24.4	24.4	
Tensile Strength, psi	45,326 psi	45,170 psi	45,870 psi	40,010 psi	
Elongation at Break, %	1.93 %	1.96 %	1.98 %	1.67 %	D638
Tensile modulus, psi	2.53 x 10 <sup>6</sup> psi	2.62 x 10 <sup>6</sup> psi	2.52 x 10 <sup>6</sup> psi	2.65 x 10 <sup>6</sup> psi	
Flexural Strength, psi	65,308 psi	62,285 psi	66,667 psi	65,461 psi	D790
Flexural Modulus, psi	2.83 x 10 <sup>6</sup> psi	2.56 x 10 <sup>6</sup> psi	3.05 x 10 <sup>6</sup> psi	2.64 x 10 <sup>6</sup> psi	
Glass Transition Temperature, DMA: T <sub>g</sub>	180°F	196°F	205°F	196°F	D4065
Coefficient of Thermal Expansion, Range 50°C to 100°C	3.73 x 10 <sup>-5</sup> in./in./ °F	4.3 x 10 <sup>-5</sup> in./in./ °F	4.15 x 10 <sup>-5</sup> in./in./ °F	4.14 x 10 <sup>-5</sup> in./in./ °F	D696

**PACKAGING WEIGHTS**

	Quart Kit	Gallon Kit	Pail Kit	Drum Kit
PT2050 Part A	2.25 lb.	7.5 lb.	48 lb.	500 lb.
PT2050 Part B	0.53 lb.	1.75 lb.	11 lb.	
PT2050 Part B1		2 lb.	13 lb.	135 lb.
PT2050 Part B2		2 lb.	13 lb.	135 lb.
PT2050 Part B3	0.6 lb.	1.9 lb.	12 lb.	126 lb.

**SAFETY and HANDLING**

PTM&W epoxy products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W epoxy resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

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**PTM&W Industries, Inc.**

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092

562-946-4511 800-421-1518 FAX: 562-941-4773

Visit Us At: [www.ptm-w.com](http://www.ptm-w.com) Send Questions To: [info@ptm-w.com](mailto:info@ptm-w.com)