
# System 2000 Epoxy Resin

*Part # - 2000, 2020, 2060, 2120*

**Features & Benefits:**

- 2000 Epoxy Resin is a medium viscosity, unfilled, light amber laminating resin that is designed for structural production applications.
- When used with the three 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 of fabrics made with these fibers.
- These products can be considered low toxicity materials that have minimum hazard potential when used properly and in a clean and responsible manner.
- 2000 does not contain methylene dianiline (MDA), or other potentially harmful aniline derivatives.
- Neither the resin nor the hardeners will crystallize in normal shipping and storage conditions. Both components have excellent moisture resistance, for minimal problems in high humidity environments.

**DESCRIPTION**

System 2000 Epoxy Resin is a medium viscosity, light amber laminating resin that is designed for fabricating parts and other demanding structural applications. Use this system to maximize the physical properties of carbon fiber, Kevlar®, and glass laminates! Test results have proven superiority over other room temperature epoxies. Its low viscosity and great handling characteristics make it a favorite in the shop too!

Three high performance hardener systems are available for the System 2000 resin. 20 minute, 60 minute and 120 minute pot life versions are all options. This added variety allows the fabricator to select the system best suited to the size, complexity, or time-frame of the project. Simple parts which need to be demolded quickly should use the 20 minute hardener. Larger and more complex parts can use either of the other hardeners.

Vacuum Bagging applications would typically warrant the longest 2 hour working time. As with any epoxy system, adhere to the proper mix ratios and maintain an adequate curing temperature of at least 70 degrees F. The cure time will be cut in half for every 10 degrees F that the temperature is raised above 70 degrees F. Purchase a single cure, or buy resin in bulk and order a variety of hardeners to keep on hand for any project.

Chopped strand mat contains a binder which prevents proper bonding with any epoxy resins. Use our polyester or vinyl ester resins with chopped strand mat.



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**HANDLING and CURING**

2060 and 2120 are the hardeners typically used to fabricate high performance composite parts. 2060 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, 2060 should only be used for smaller parts. Hardener 2120 has a longer working time that is useful for vacuum bagging larger parts before the resin has gelled. In sufficient mass, both of these hardeners will cure completely at room temperature (77°F or above). However, when constructing 2-3 ply, thin laminates and when overnight demolding and sandability is required, some heat should be applied to the 2060 system, and must be utilized when using 2120 hardener. 2060 will re quire only moderate heat to gel hard. The application of as low as 90°F is usually sufficient. This temperature can be easily achieved by either tenting the laminate or putting it in a box and using incandescent light bulbs to generate this temperature. 2120 hardener should be given a cure of 12 to 14 hours at 120°F to 130°F to insure a hard gel sufficient for demolding and sandability.

In thicker laminates and larger masses with these hardeners, plan to allow the laminate to cure at least 24 hours, at a minimum of 75°F, before moving the structure. This can be accelerated by applying heat after the resin has gelled as described above. Be careful using heat guns and lamps, as they tend to concentrate heat, producing localized hot spots which can damage the epoxy. The higher the curing temperature, the higher the resulting service temperature. With a higher temperature cure, a safe service temperature over 200°F can be obtained.

Hardener 2020 will cure completely at room temperature, and does not re quire 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 2060 or 2120 to take advantage of their longer work life and better service temperature capabilities.

**SAFETY and HAN DLING**

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 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, all epoxy resins and hardeners can be irritating to the skin, and prolonged contact may result in sensitization; and breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid con tact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, 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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## Product Specifications

| | 2000 | 2020 | 2060 | 2120 | ASTM Method |
|---|---|---|---|---|---|
| Color | Lt. Amber | Amber | Amber | Amber | Visual |
| Viscosity, @ 77° F, centipoise | 1,650 cps | 150-175 cps | 190-200 cps | 200-250 cps | D2393 |
| Specific Gravity, gms./cc | 1.15 | 0.96 | 0.96 | 0.95 | D1475 |
| Mix Ratio, By Wt | | 100 : 23 By Weight, or 4 to 1 By Volume | 100 : 27 By Weight, or 3 to 1 By Volume | | D2471 |
| Pot Life, 4 fl. Oz. Mass @ 77° F | | 20 minutes | 1 hour | 2 hour | PTM&W |

## Typical Mechanical Properties

| | 2000 w/ 2020 | 2000 with 2060 | | | | 2000 w/ 2120 | ASTM Method |
|---|---|---|---|---|---|---|---|
| | | Neat Resin (Unreinforced) | With Fiberglass | With Carbon | With Kevlar | | |
| Mix Ratio | 100 : 27 By Weight, or 3 to 1 By Volume | | | | | | PTM&W |
| Pot Life, @ 77° F | 20 minutes | 1 hour | | | | 2 hours | D2471 |
| Color | Lt. Amber | Light Amber | | | | Lt. Amber | Visual |
| Mixed Viscosity, @ 77° F, cps | 950-975 cps | 900 - 950 cps | | | | 925 – 975 cps | D2393 |
| Cured Hardness, Shore D | 86-88 Shore D | 88 Shore D | | | | 87 Shore D | D2240 |
| Specific Gravity, grams, cc | 1.12-1.13 | 1.11 | | | | 1.12 | D1475 |
| Density, lb./cu Inch | .0410 | .0401 | | | | .0410 | D792 |
| Specific Volume, cu. in./lb. | 24.4 | 25.0 | | | | 24.4 | D792 |
| Tensile Strength, psi (1) | 45,326 psi | 9828 psi | 45,170 psi | 75,640 psi | 45,400 psi | 45,870 psi | D638 |
| Elongation at Break, % (1) | 1.93% | 1.90% | 1.96% | 0.91% | 1.31% | 1.98% | D638 |
| Tensile modulus, psi (1) | 2,.53 x $10^6$ psi | 418,525 psi | 2,620,000 psi | 8,170,000 psi | 3,770,000 psi | 2,520,000 psi | D638 |
| Flexual Strength | 65,308 psi | 16,827 psi | 62,285 psi | 96,541 psi | 34,524 psi | 66,667 psi | D790 |
| Glass Transition Temp. Tg | 180° F | 196° F | | | | 194° F | TMA |
| Thermal Coef. Of Expansion Range: | 3.73 x $10^{-5}$ in./in./ ° F | 4.3 x $10^{-5}$ in./in./ ° F | | | | 4.15 x $10^{-5}$ in./in./ ° F | D696 |
| Fiberglass Properties Derived with A 10 Ply Laminate, Hand Lay-up, Style 181 Glass Fabric, 55% Glass Content; Carbon Properties with a 10 Ply Laminate of 5.6 oz. 3K Fabric; and Kevlar Properties with a 10 Ply Laminate of 5 oz. Kevlar | | | | | | | |



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