

PRO-SET®

Technical Data

LAM-135

LAM-224

LAMINATING EPOXY

COMBINED FEATURES

Medium viscosity for good wet out of all synthetic composite fabrics and core materials.

Fast cure speed hardener provides a 40 minutes working time at 77°F (25°C). A typical laminate will be gelled in 1.5 to 2 hours.

Optimized for hand wet out and machine impregnation in contact molding, vacuum bagging and filament winding applications.

Excellent for taping and tabbing operations in composite structure assembly.

Room temperature cure properties suitable for many composite components and structures.

T_g as high as 223°F (106°C) with proper post cure providing excellent temperature stability and great part cosmetics.

Cost effective, high performance epoxy formulation for synthetic composite manufacturing.

Quality-control tinting is available at no extra charge; simply add "QC" after the product code on your order.

Shelf life is 3 years for resin and 2 years for hardener when properly stored³.

The New
Standard

EPOXIES for
Laminating
Infusion
Tooling
Assembly

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ISO9001:2008 Certified

Rev 3 / Dec 2015

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HANDLING PROPERTIES

| Property | Standard | Units | 72°F (22°C) | 77°F (25°C) | 85°F (29°C) |
|----------------------|------------|---------|-------------|-------------|-------------|
| 150g Pot Life | ASTM D2471 | minutes | 13-17 | 11-15 | 9-11 |
| 500g Pot Life | ASTM D2471 | minutes | 13-17 | 11-15 | 9-11 |
| Viscosity Mixed | ASTM D2196 | cP | 1705 | 1360 | 970 |
| Viscosity (resin) | ASTM D2196 | cP | 6890 | | |
| Viscosity (hardener) | ASTM D2196 | cP | 75 | | |

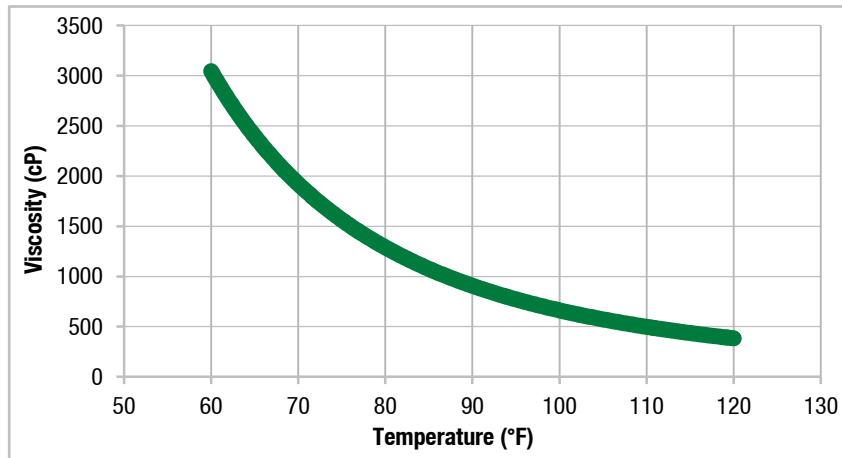
MIX RATIO

| Method | Resin:Hardener | Resin:Hardener |
|--------------|----------------|-------------------|
| Weight | 3.5:1 | 100:28.8 |
| Weight Range | 3.25:1–3.97:1 | 100:30.8–100:25.2 |
| Volume | 3.00:1 | 100:33.3 |
| Volume Range | 2.80:1–3.43:1 | 100:35.7–100:29.2 |

DENSITY

| State | Units | 72°F (22°C) |
|----------|---------------|-------------|
| Cured | lb/gal (g/cc) | 9.76 (1.17) |
| Resin | lb/gal (g/cc) | 9.71 (1.16) |
| Hardener | lb/gal (g/cc) | 8.38 (1.00) |

VISCOSITY VS TEMPERATURE



Test specimens were neat epoxy (without fiber reinforcement).
Typical values, not to be construed as specification.

LAM-135~LAM-224

LAMINATING EPOXY

MECHANICAL PROPERTIES

| Property | Standard | Units | 72°F (22°C) x 4 wk | 77°F (25°C) x 2 wk | RT Gelation + 120°F (49°C) x 8 hrs | RT Gelation + 140°F (60°C) x 8 hrs | RT Gelation + 180°F (82°C) x 8 hrs |
|--------------------|------------|-----------|-----------------------|-----------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| Hardness | ASTM D2240 | Type D | 86 | 88 | 83 | 85 | 87 |
| Compression Yield | ASTM D695 | psi (MPa) | 15,100 (104) | 14,200 (98) | 15,000 (103) | 15,000 (103) | 15,000 (103) |
| Tensile Strength | ASTM D638 | psi (MPa) | 10,800 (74) | 11,100 (77) | 11,000 (76) | 11,000 (76) | 11,500 (79) |
| Tensile Modulus | ASTM D638 | psi (GPa) | 5.61E+05 (3.87) | 5.49E+05 (3.79) | 5.44E+05 (3.75) | 4.93E+05 (3.4) | 4.75E+05 (3.28) |
| Tensile Elongation | ASTM D638 | % | 3.1 | 4.9 | 4.4 | 4.4 | 6.7 |
| Flexural Strength | ASTM D790 | psi (MPa) | 17,800 (123) | 17,000 (117) | 18,400 (127) | 18,600 (128) | 20,300 (140) |
| Flexural Modulus | ASTM D790 | psi (GPa) | 5.45E+05 (3.76) | 4.72E+05 (3.25) | 5.24E+05 (3.61) | 5.07E+05 (3.5) | 4.88E+05 (3.36) |

THERMAL PROPERTIES

| Property | Standard | Units | 72°F (22°C) x 4 wk | 77°F (25°C) x 2 wk | RT Gelation + 120°F (49°C) x 8 hrs | RT Gelation + 140°F (60°C) x 8 hrs | RT Gelation + 180°F (82°C) x 8 hrs |
|------------------------------|-------------------------|---------|-----------------------|-----------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| Tg DMA Peak Tan Delta | ASTM E1640 ¹ | °F (°C) | 180 (82) | 177 (80) | 208 (98) | 216 (102) | 242 (117) |
| Tg DMA Onset Storage Modulus | ASTM E1640 ¹ | °F (°C) | 151 (66) | 151 (66) | 166 (75) | 181 (83) | 223 (106) |
| Tg DSC Onset– 1st Heat | ASTM E1356 | °F (°C) | 137 (58) | 135 (57) | 165 (74) | 182 (84) | 211 (99) |
| Heat Deflection Temperature | ASTM D648 | °F (°C) | 138 (59) | 137 (58) | 154 (68) | 169 (76) | 186 (86) |
| Tg DSC Ultimate | ASTM E1356 | °F (°C) | | | 213 (101) ² | | |

¹ 1 Hz, 3°C per minute.

² Additional post cure may be required; contact Technical Department for details.

³ Store PRO-SET® Epoxy resins and hardeners at room temperature in sealed containers until shortly before use. As with many high-performance epoxy resins, repeated exposure to low temperatures during storage may cause the resin to crystallize. If this occurs, warm the resin to 125° F and stir to dissolve crystals. Hardeners may form carbamation when exposed to CO₂ and moisture in the atmosphere for extended periods of time. Prevent carbamation by protecting hardeners from exposure until immediately prior to processing.

Rev 3 / Dec 2015