



Rhino™

Rhino™ 1401-21T / 4101-21 Thixotropic Epoxy System for Hand Lay-Up Data Sheet



ISO 9001:2000
FM62236

Resin – Part # 1401-21T
Hardener – Part # 4101-21 Slow, 4101-21 Fast

DESCRIPTION:

Multifunctional epoxy and cycloaliphatic-amine blend hardener for high performance composite parts. Thixotropic 1401-21“T” resin helps to prevent drainage in laminate on vertical surfaces. Two curing agents (4101-21 fast and 4101-21 slow) provide a complete range of working times from 40 minutes to 6 hours, and by blending the curing agents, any point in between. Rhino 1401-21T with 4101-21 provides for ample pot life with fast cure development at standard process temperatures. Rhino 1401-21T provides good thermal resistance, excellent fatigue and inter-laminar shear strength with rapid wetting of E-glass fiber reinforcements. Rhino 1401-21T Epoxy Resin is formulated for highly increased E-glass fiber compatibility with zero VOCs and 100% solids.

SUGGESTED USES:

Hand Lay-Up of fiberglass reinforced parts and tooling.

SYSTEM LIQUID PROPERTIES:

| | |
|---------------------------------------|---------------------------------|
| Viscosity 1401-21T Resin, 77°F | 2,300 – 2,700 cps (thixotropic) |
| Viscosity 4101-21 Slow Hardener, 77°F | 20 cps |
| Viscosity of 4101-21 Fast Hardener | 50 cps |
| Mix Ratio, Resin to Hardener | 100:30 by weight |
| Weight Per Gallon, 1401-21T Resin | 9.5 – 9.6 lbs. |
| Weight Per Gallon, 4101-21 Hardener | 7.9 – 8.1 lbs. |
| Weight per Gallon, Mixed | 9.2 lbs |
| Mixed Viscosity, 77°F | 350 – 550 cps (thixotropic) |

GEL TIME RECIPE TABLE:

Rhino 1401-21 Resin, 100 parts / Rhino 4101-21 (all), 30 parts:

| Gel Time, 150 grams at 77°F | Percent of 4101-21 Slow | Percent of 4101-21 Fast |
|-----------------------------|-------------------------|-------------------------|
| 360 minutes | 100% (30PHR) | - |
| 160 minutes | 90% (27PHR) | 10% (3PHR) |
| 100 minutes | 75% (23PHR) | 25% (7PHR) |
| 70 minutes | 60% (18PHR) | 40% (12PHR) |
| 40 minutes | - | 100% (30PHR) |

RESIN MIXING BASICS:

Condition epoxy resin and hardener to between 20°C and 35°C (68°F to 95°F) to ensure proper mixed viscosity. Introduce mixed material onto part or reinforcement(s). Curing temperature(s) between 40°C and 65°C (104°F to 149°F). Hold at this temperature for between 4 and 6 hours. Cure temperatures may be from 50°C to 85°C to accomplish maximum HDT. Optimum cure time(s) versus temperature(s) will depend on parameters such as part thickness or size.

REINFORCEMENT TYPES:

Rhino 1401-21T Epoxy Resin is specially formulated for compatibility with E-glass and carbon fiber reinforcements.

ADVANTAGES OF RHINO 1401-21 EPOXY RESIN:

Due to the highly thixotropic nature of 1401-21T epoxy resin, it is possible to laminate thick sections without vertical drainage of the epoxy resin. Rhino 1401-21T Epoxy Resin is formulated to improve the intimate bond between the epoxy resin and E-glass or carbon fiber reinforcements. This formulation technique results in increased physical properties as follows:

- * Fiber Pull-Out Strength
- * Flexural Strength and Modulus
- * Impact Resistance
- * Tensile Strength and Modulus
- * Compressive Strength
- * Inter-Laminar Shear Strength

Of equal, if not greater significance is the retention of the above properties after exposure to heat, cycle fatigue, water, expected adverse environmental reagents such as salt spray, acid rain, etc. The formulation of 1401-21T Epoxy Resin results in minimal degradation of the cured composite's physical properties as compared to epoxy resin systems not containing the proprietary formulation constituents of 1401-21T Epoxy Resin. The benefit to the composite fabricator is obvious and clear: Increased product life and confidence!

Rhino™ 1401-21T / 4101-21

CURED PHYSICAL PROPERTIES OF COMPOSITE:

A-260 unidirectional E-glass (epoxy compatible rovings) with Rhino 1401-21T Epoxy Resin and 4101-21 Epoxy Hardener (70:30 glass to resin ratio). Cure schedule - 2 hrs at 35°C (infusion) / 4 hrs at 65°C (basic cure) / 2 hours at 85°C (final cure).

| PROPERTY | RESULT | TEST METHOD |
|--|---------------|--------------|
| Tensile Strength | 83,00 psi | ASTM D-638 |
| Tensile Modulus | 5,250,000 psi | ASTM D-638 |
| 90° Tensile Strength | 6.05 ksi | ASTM D-3039 |
| In-Plane Shear Strength (4 plies ±45°) | 9.14 ksi | ASTM D-3518 |
| Flexural Strength | 86,000 psi | ASTM D-790 |
| Flexural Modulus | 2,490,000 psi | ASTM D-790 |
| Izod Impact | 44.5 ft/lb/in | ASTM D-256-A |
| Water Absorption | 0.09% | ASTM D-570 |
| Barcol Hardness | 64 | |

CURED PHYSICAL PROPERTIES OF NEAT RESIN:

Rhino 1401T-21 Epoxy Resin, 100 parts, Rhino 4101-21 Epoxy Hardener, 30 parts. Cured 2 hrs at 35°C (infusion) + 4 hrs at 65°C (basic cure).

| PROPERTY | RESULT | TEST METHOD |
|-------------------------------|--------------|-----------------------|
| Tg (DSC) | 194°F (90°C) | IPC-TM-650, 2.4 – 2.5 |
| Shore D Hardness | 90D | - |
| Tensile Strength | 10.30 ksi | ASTM D-638 |
| Ultimate Elongation | 7.4 – 7.5% | ASTM D-638 |
| Tensile Modulus | 465 ksi | ASTM D-638 |
| Ultimate Compressive Strength | 14,500 psi | Sandia Labs Method |
| Flexural Strength | 18.65 ksi | ASTM D-790 |
| Flexural Modulus | 430 ksi | ASTM D-790 |

HOW SUPPLIED:

Rhino 1401-21T/4101-21: Supplied in 5 Gallon Pails, 55 Gallon Drums and 250 Gal IBC's.

SAFETY PRECAUTIONS:

Health Considerations: Consult the Rhino Linings® Material Safety Data Sheets.

This chemical system requires the use of proper safety equipment and procedures. Please follow the Rhino Linings® product MSDS and Safety Manual for detailed information and handling guidelines.

For Your Protection:

The information and recommendations in this publication are, to the best of our knowledge, reliable. Suggestions made concerning the products and their uses, applications, storage and handling are only the opinion of Rhino Linings Corporation. Users should conduct their own tests to determine the suitability of these products for their own particular purposes and of the storage and handling methods herein suggested. The toxicity and risk characteristics of products made by Rhino Linings Corporation will necessarily differ from the toxicity and risk characteristics developed when such products are used with other materials during a manufacturing process. The resulting risk characteristics should be determined and made known to ultimate end-users and processors. Because of numerous factors affecting results, **Rhino Linings Corporation makes no warranty of any kind, express or implied**, other than that the material conforms to its applicable current Standard Specifications. Rhino Linings Corporation hereby disclaims any and all other warranties, including but not limited to those of merchantability or fitness for a particular purpose. No statements made herein may be construed as a representation or warranty. The liability of Rhino Linings Corporation for any claims arising from or sounding in breach of warranty, negligence, strict liability, or otherwise shall be limited to the purchase price of the material.

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