

DERAKANE MOMENTUM™ 411-350 Epoxy Vinyl Ester Resin

November 2004

A New Generation of Epoxy Vinyl Ester Resins

DERAKANE MOMENTUM 411-350 epoxy vinyl ester resin is based on bisphenol-A epoxy resin and provides resistance to a wide range of acids, alkalis, bleaches, and organic compounds for use in many chemical processing industry applications. DERAKANE MOMENTUM resins are a new generation of resins that can be used to improve fabrication efficiency and product quality. Their lighter color makes defects easier to see and correct while the resin is still workable. The resin's improved reactivity properties often permit an increase in the lay-up thickness per session. The longer shelf life provides additional flexibility to fabricators in storage and handling.

Typical Liquid Resin Properties

Property ⁽¹⁾	Value
Density, 25°C/77°F	1.046 g/mL
Dynamic Viscosity, 25°C/77°F	370 mPas
Kinematic Viscosity	350 cSt
Styrene Content	45%
Shelf Life ⁽²⁾ , Dark, 25°C/77°F	12 months

(1) Typical property values only, not to be construed as specifications.

(2) Unopened drum with no additives, promoters, accelerators, etc. added. Shelf life specified from date of manufacture.

Applications and Fabrication Techniques

- FRP storage tanks, vessels, ducts, and on-site maintenance projects, particularly in chemical processing and pulp and paper operations.
- The resin is designed for ease of fabrication using hand lay-up, spray-up, filament winding, compression molding and resin transfer molding techniques, pultrusion and molded grating applications.
- An alternate viscosity, optimized for some vacuum infusion processes, is available as DERAKANE MOMENTUM™ 411-100 resin.

Benefits

- Provides resistance to wide range of acids, alkalis, bleaches, and solvents. This resin holds up in corrosive environments, postponing the need for equipment replacement.
- Tolerates heavy design loads without causing failure due to resin damage. This facilitates working with large weight-bearing equipment with confidence.
- Superior elongation and toughness provides FRP equipment with better impact resistance and less cracking due to cyclic temperature, pressure fluctuations, and mechanical shocks providing a safety factor against damage during process upsets or during shipping installation.
- When properly formulated and cured, complies with FDA regulation 21 CFR 177.2420, covering materials intended for repeated use in contact with food.



Ashland is committed to the continuous evolution of technology and service solutions that promote health, safety and environmental protection around the world.

[®] Registered trademark and [™] trademark of Ashland Inc.

* Registered service mark of the American Chemistry Council

© 2002, 2004 Ashland Inc. All Rights Reserved. 7 CWT-DS-344 Rev. 1

All statements, information and data presented herein are believed to be accurate and reliable but are not to be taken as a guarantee, express warranty or implied warranty of merchantability or fitness for a particular purpose, or representation, express or implied, for which seller assumes legal responsibility, and they are offered solely for your consideration, investigation and verification. Statements or suggestions concerning possible use of this product are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe on any patent.

Gel Time Formulations

The following table provides typical gel times for MEKP. “Starting point” formulations for MEKP, non-foaming MEKP alternatives, and BPO peroxides are available in separate product bulletins. These and other information are available at www.derakane.com.

MEKP Gel Time Table**Typical Gel Times⁽³⁾ Using NOROX⁽⁴⁾ MEKP-925H⁽⁵⁾ and Cobalt Naphthenate-6%⁽⁶⁾**

Temperature	15 +/-5 Minutes	30 +/-10 Minutes	60 +/-15 Minutes
15°C/59°F	1.5 phr ⁽⁷⁾ MEKP 0.30 phr CoNap6% 0.60 phr DEA	1.5 phr MEKP 0.20 phr CoNap6%	1.5 phr MEKP 0.05 phr CoNap6%
20°C/68°F	1.5 phr MEKP 0.30 phr CoNap6%	1.0 phr MEKP 0.10 phr CoNap6%	1.0 phr MEKP 0.10 phr CoNap6% 0.02 phr 2,4-P
25°C/77°F	1.0 phr MEKP 0.2 phr CoNap6%	1.0 phr MEKP 0.05 phr CoNap6%	1.0 phr MEKP 0.05 phr CoNap6% 0.015 phr 2,4-P
30°C/86°F	1.0 phr MEKP 0.05 phr CoNap6%	1.0 phr MEKP 0.05 phr CoNap6% 0.015 phr 2,4-P	1.0 phr MEKP 0.05 phr CoNap6% 0.035 phr 2,4-P
35°C/95°F	1.0 phr MEKP 0.05 phr CoNap6% 0.01 phr 2,4-P	1.0 phr MEKP 0.05 phr CoNap6% 0.03 phr 2,4-P	1.0 phr MEKP 0.05 phr CoNap6% 0.06 phr 2,4-P

(3) Thoroughly test any other materials in your application before full-scale use. Gel times may vary due to the reactive nature of these products. Always test a small quantity before formulating large quantities.

(4) Registered trademark of Norac Inc.

(5) Materials: NOROX MEKP-925H Methyl ethyl ketone peroxide (MEKP) or equivalent low hydrogen peroxide content MEKP, Cobalt Naphthenate-6% (CoNap6%), Diethylaniline (DEA), and 2,4-Pentanedione (2,4-P). Use of other MEKP or other additives may result in different gel time results.

(6) Use of cobalt octoate, especially in combination with 2,4-P can result in 20-30% slower gel times.

(7) Phr=parts per hundred resin molding compound

Casting Properties**Typical Properties⁽¹⁾ of Postcured⁽⁸⁾ Resin Clear Casting**

Property	SI	US Standard	Test Method
Tensile Strength	86 MPa	12,000 psi	ASTM D-638/ISO 527
Tensile Modulus	3.2 GPa	4.6 x 10 ⁵ psi	ASTM D-638/ISO 527
Tensile Elongation, Yield	5-6%	5-6%	ASTM D-638/ISO 527
Flexural Strength	150 MPa	22,000 psi	ASTM D-790/ISO 178
Flexural Modulus	3.4 GPa	4.9 x 10 ⁵ psi	ASTM D-790/ISO 178
Density	1.14 g/cm ³		ASTM D-792/ISO1183
Volume Shrinkage	7.8%	7.8%	
Heat Distortion Temperature ⁽⁹⁾	105°C	220°F	ASTM D-648 Method A/ISO 75
Glass Transition Temperature, Tg2	120°C	250°F	ASTM D-3419/ISO 11359-2
Barcol Hardness	35	35	ASTM D-2583/EN59

(1) Typical property values only, not to be construed as specifications. SI values reported to two significant figures; US standard values based on conversion.

(8) Cure schedule: 24 hours at room temperature; 2 hours at 120°C (250°F)

(9) Maximum stress: 1.8 MPa (264 psi)



Ashland is committed to the continuous evolution of technology and service solutions that promote health, safety and environmental protection around the world.

® Registered trademark and ™ trademark of Ashland Inc.

* Registered service mark of the American Chemistry Council

© 2002, 2004 Ashland Inc. All Rights Reserved. 7 CWT-DS-344 Rev. 1

All statements, information and data presented herein are believed to be accurate and reliable but are not to be taken as a guarantee, express warranty or implied warranty of merchantability or fitness for a particular purpose, or representation, express or implied, for which seller assumes legal responsibility, and they are offered solely for your consideration, investigation and verification. Statements or suggestions concerning possible use of this product are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe on any patent.

Laminate Properties**Typical Properties⁽¹⁾ of Postcured⁽¹⁰⁾ 6 mm (1/4") Laminate⁽¹¹⁾**

Property	SI	US Standard	Test Method
Tensile Strength	150 MPa	22,000 psi	ASTM D-3039/ISO 527
Tensile Modulus	12 GPa	1.7 x 10 ⁶ psi	ASTM D-3039/ISO 527
Flexural Strength	210 MPa	30,000	ASTM D-790/ISO 178
Flexural Modulus	8.1 GPa	1.2 x 10 ⁶ psi	ASTM D-790/ISO 178
Glass Content	40%	40%	ASTM D-2584/ISO 1172

(1) Typical property values only, not to be construed as specifications. SI values reported to two significant figures; US standard values based on conversion.

(10) Cure schedule: 24 hours at room temperature; 6 hours at 80°C (175°F)

(11) 6 mm (1/4") Construction – V/M/M/Wr/M/Wr/M

V = Continuous veil glass; M = Chopped strand mat; 450 g/m² (1.5 oz/ft²);

Wr = Woven roving, 800 g/m² (24 oz/yd²)

Safety and Handling Consideration

This resin contains ingredients which could be harmful if mishandled. Contact with skin and eyes should be avoided and necessary protective equipment and clothing should be worn.

Ashland maintains Material Safety Data Sheets on all of its products. Material Safety Data Sheets contain health and safety information for your development of appropriate product handling procedures to protect your employees and customers.

Our Material Safety Data Sheets should be read and understood by all of your supervisory personnel and employees before using Ashland's products in your facilities.

Recommended Storage:

Drums - Store at temperatures below 27°C/80°F. Storage life decreases with increasing storage temperature. Avoid exposure to heat sources such as direct sunlight or steam pipes. To avoid contamination of product with water, do not store outdoors. Keep sealed to prevent moisture pick-up and monomer loss. Rotate stock.

Bulk - See Ashland's Bulk Storage and Handling Manual for Polyesters and Vinyl Esters. A copy of this may be obtained from Composite Polymers at 1.614.790.3333.

<u>Product Name</u>	<u>Product Code</u>	<u>Standard Package*</u>
MOMENTUM 411-350	536-000	55-Gal Drum, Net Weight 452 Lbs. 210 Liter, Net Weight 205 Kg *Non-Returnable



Ashland is committed to the continuous evolution of technology and service solutions that promote health, safety and environmental protection around the world.

® Registered trademark and ™ trademark of Ashland Inc.

* Registered service mark of the American Chemistry Council

© 2002, 2004 Ashland Inc. All Rights Reserved. 7 CWT-DS-344 Rev. 1

All statements, information and data presented herein are believed to be accurate and reliable but are not to be taken as a guarantee, express warranty or implied warranty of merchantability or fitness for a particular purpose, or representation, express or implied, for which seller assumes legal responsibility, and they are offered solely for your consideration, investigation and verification. Statements or suggestions concerning possible use of this product are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe on any patent.