

INTERPLASTIC CORPORATION

Thermoset Resins Division

Comparison of Corrosion Resistant and Marine Resins

This guide was prepared by the Thermoset Resins Division laboratory to illustrate comparisons among the different corrosion resistant resins available.

Please keep in mind that the inherent differences in polymer design and manufacturing techniques will result in different composite strengths and corrosion resistance.

PREMIUM CORROSION RESISTANT RESINS

BRAND	INTERPLASTIC CoREZYN®	ASHLAND	REICHHOLD DION® & ATLAS®	AOC VIPEL®	HEXION SPECIALTY CHEMICALS	IFC NORTH AMERICA, INC.
Bisphenol A Vinyl Esters	VE8300 ^{1,10}	Hetron® 922 ¹ , Derakane® 411 ¹	9100 ¹	F010	785-8430	-
	VE8100 ¹	Derakane 411C ¹ , Hetron 922L	-	F015	781-2140	-
	VE8360 ^{1,9}	Hetron 942/35, Derakane 441-400 ¹	-	-	781-0430 ³	-
High Crosslink Density Vinyl Esters	VE8710 ^{1,9}	Hetron 980	-	F080, F083	-	-
	VE8470 ^{9,13}	-	-	-	-	-
	VE8730 ^{10,11}	Derakane 470, Hetron 970	-	F085	-	-
	VE8730-34 ^{10,11}	-	-	-	-	-
	VE8770 ¹²	-	-	-	-	-
Epoxy Novolac Vinyl Esters	VE8730	Hetron 970	9480	-	-	-
	VE8730-34 ³	Hetron 970/35	-	-	-	-
High Elongation Vinyl Esters	VE8550 ³	Derakane 8084 ³	9085 ³	F017	-	-
	VE8510 ¹⁰	-	-	-	-	-
	VE8515 ¹⁰	-	-	-	-	-
Bisphenol A Fumarate Polyesters	-	Hetron 700	6694 (31734-01)	F282	-	-
Flexibilized Bisphenol A Fumarate Polyesters	-	Hetron 800	-	F282	-	-
Chlorendic Anhydride Polyesters	-	Hetron 72, Hetron 92	-	-	-	-
	I6-DA-097 ⁵	Hetron 197 ⁵	797	-	-	-
Furfuryl Alcohol Resins	-	Hetron 800	-	-	-	1001 2001

Products highlighted in each row are sold as chemical equivalents to each other.

CORROSION RESISTANT ISOPHTHALIC AND TEREPHTHALIC RESINS

BRAND	INTERPLASTIC CoREZYN®	ASHLAND AROPOL®	REICHHOLD ATLAS®	AOC VIPEL®	CCP	HEXION SPECIALTY CHEMICALS
Isophthalic	75-AQ-001 ¹	7241 ¹	33402 ¹	F701 ¹	Stypol 040-4332	741-3601 ¹
	75-AQ-001S ¹	7242 ¹	6631T ²	-	-	745-4615 ¹
	75-AQ-010 ¹	-	(33434-00 ¹)	-	-	-
	75-AQ-066 ¹	-	-	-	-	-
	75-AA-011 ²	-	-	-	-	-
Flexibilized Isophthalic	75-AQ-610 ¹	7334	33433-00 (6334)	F737, F738	Stypol 040-4280	-
	-	-	33439-00 (6246)	-	-	-
	-	7530	-	-	-	-
	-	7532	-	-	-	-
Terephthalic	77-AQ-201	-	400 (33425-00)	-	-	-
	-	-	E764	-	-	-
High Crosslink Density Isophthalic/Terephthalic	75-AA-450 ¹⁴	7334	490 (33423-00)	F-764	-	-
	75-AQ-460 ^{2,9,14}	-	-	-	-	-

Highlighted products in each row are sold as chemical equivalents to each other.

FIRE RESISTANT RESINS

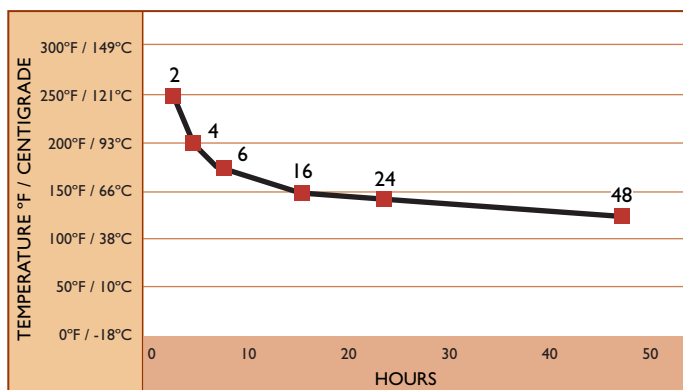
BRAND	INTERPLASTIC CoREZYN®	ASHLAND	REICHHOLD DION® & ATLAC®	AOC VIPEL®	HEXION SPECIALTY CHEMICALS
Bisphenol A Vinyl Esters	VE8440 ^{4,8}	Hetron® 992, Derakane® 510A ⁴	9300 ⁴	K022-B	755-8590
	VE8430 ⁶	Hetron FR998 ⁴	-	-	-
	VE8450 ⁵	Derakane 510C ⁵	-	-	-
	VE8470 ^{4,8}	-	-	K095	-
Epoxy Novolac Vinyl Esters	-	Derakane 510N ⁵	-	-	-
Bisphenol A Polyesters	-	-	31-736-00 ⁴	-	-
	-	-	711-05AS ⁴	-	-
	-	-	6695 ⁴	-	-
Chlorendic Anhydride Polyesters	16-DA-097 ⁵	Hetron 197 ⁵	797 ⁵	K190-B	-
	105-58 ^{4,7}	Hetron 92 ⁴	-	K190-A	-
	16-AA-105 ^{4,7}	-	-	-	-
Isophthalic Polyesters	-	99P ⁴	6604T ⁴	K733	-

Products highlighted in each row are sold as chemical equivalents to each other.

PROPERTIES OF UNFILLED CASTINGS

RESIN	BARCOL HARDNESS 934-I Gauge	HEAT DISTORTION TEMPERATURE °F (°C)	TENSILE ELONGATION (%)
75-AQ-001	42-47	220 (104)	1.7
75-AQ-001S	42-47	220 (104)	1.7
75-AQ-010	40-45	215 (102)	2.4
75-AA-011	40-45	215 (102)	2.2
75-AQ-066	42-47	220 (104)	1.7
75-AA-450	42-48	265 (129)	1.8
75-AQ-460	42-46	232 (111)	2.2
75-AQ-610	37-43	185 (85)	2.2
VE8100	30-38	220 (104)	4.5
VE8300	30-38	210 (99)	5.0
VE8360	34-40	240 (115)	4.1
VE8430	32-38	196 (91)	2.8
VE8440	40-48	225 (107)	4.0
VE8450	38-45	240 (115)	4.0
VE8470	42-50	240 (115)	3.8
VE8510	20-30	175 (79)	10.0
VE8515	15-23	145 (62)	15.0
VE8550	30-35	190 (88)	7.0
VE8710	40-48	220 (104)	2.0
VE8730	40-45	280 (138)	3.0
VE8770	40-48	300 (149)	1.0

RECOMMENDATIONS FOR A POST CURE SCHEDULE



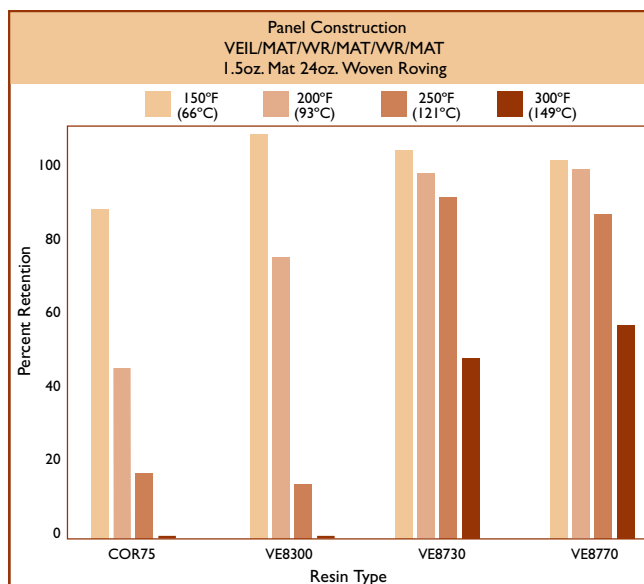
Our recommendations are based on laboratory experience and will not predict all aspects of production cure. Please work with us to ensure adequate cure using analysis by Differential Scanning Calorimetry (DSC) degree of cure or Dynamic Mechanical Analysis (DMA) for glass transition (T_g).

MARINE VINYL ESTER AND MODIFIED VINYL ESTER RESINS

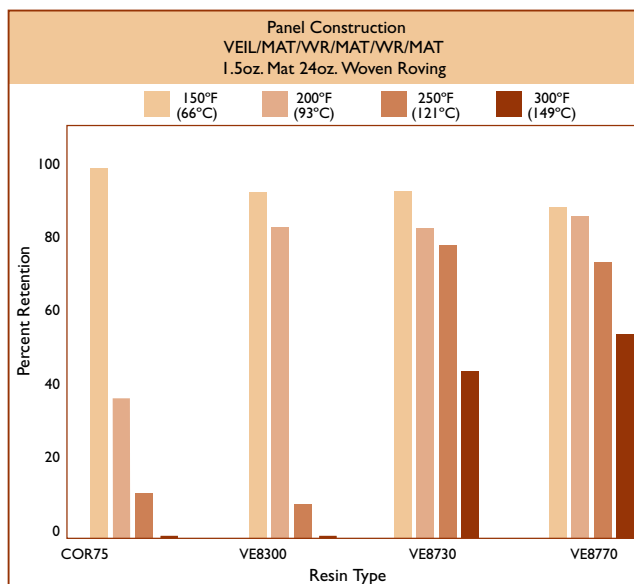
COMPANY	INTERPLASTIC CoREZYN®	ASHLAND	REICHHOLD HYDREX®	AOC HYDROPEL®	CCP
Vinyl Ester	VE8110 ¹⁸	Derakane® 411-700T	-	-	-
	VE8121 ¹⁸	Derakane 411-700PAT	100 (33350)	E-010-TC	-
	VE8121LH Series ^{17,18,22}	-	-	-	-
	VE8153 ²⁰	-	-	-	-
	VEX169-826 ^{19,21}	-	-	-	-
	VEX187-647 ²¹	-	-	-	-
Modified Vinyl Ester	MVR8011 ^{15,17,18}	AME® 5000 ¹⁵	100LS (33390) ³	H-034A ¹⁵	-
	MVR8021	AME 4000	-	-	-
	MVR8031	-	33250, 33253	-	ArmorStar® VSX ¹⁵ , VBX ¹⁵
	MVR8031LH Series ^{15,17,18}	-	-	-	-
	VEX200-472 ¹⁵	AME 1000 ¹⁵	-	-	-

Products highlighted in each row are sold as chemical equivalents to each other.

FLEXURAL MODULUS AS A FUNCTION OF TEMPERATURE



FLEXURAL STRENGTH AS A FUNCTION OF TEMPERATURE



Comparison of Resin Chemistries

Bisphenol A Epoxy Resins

- Liquid temperature: 200°F (93°C).
- Vapor temperature: 210°F (99°C).
- Satisfactory in alkaline environments.
- Offer excellent flexibility.
- Good performance in organic and inorganic acids and oxidizing compounds.
- CoREZYN VE8300, VE8360 and VE8100 are typical products.
- CoREZYN VE8360 offers less than 35% styrene and has corrosion resistance equal to CoREZYN VE8300.

Flame Resistant Resins

- CoREZYN VE8440 has an ASTM E84 tunnel test flame spread rating of less than 75 without additives and less than 25 with the addition of 1.5% antimony trioxide.
- CoREZYN VE8450 has an ASTM E84 tunnel test flame spread rating of less than 125 without additives and less than 25 with the addition of 5% antimony trioxide.
- CoREZYN VE8430 has an ASTM E162 flame spread rating of less than 25 and an ASTM E662 smoke density of less than 100 @ 4 minutes in the flaming mode when used as a blend of 55% resin and 45% alumina trihydrate.

High Crosslink Density Bisphenol A and Epoxy Novolac Vinyl Ester Resins

- Liquid temperature: 215°F (102°C).
- Vapor temperature: 225°F (107°C).
- CoREZYN VE8730 and CoREZYN VE8770 are excellent in most organic solvents.
- CoREZYN VE8710 has excellent resistance to acid.
- CoREZYN VE8470 has excellent resistance to sodium hypochlorite and other chlorinated bleaching solutions.
- CoREZYN VE8730 is a Novolac vinyl ester.

Isophthalic Polyester Resins

- Liquid temperature: 150°F (66°C).
- Vapor temperature: 160°F (71°C).
- Not recommended for pH > 10.5.
- Satisfactory for inorganic and organic acids.
- Solvent resistance acceptable for gasoline, kerosene, mineral spirits, etc.
- Not recommended for oxidizing compounds.
- CoREZYN COR75-AQ-010 is a tough isophthalic resin with the same corrosion resistance as its rigid counterparts and can be used to build thick laminates.
- CoREZYN COR75-AQ-460 contains less than 38% styrene and is compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Corrosion Resistant category.

Footnotes

1. Manufactured from FDA-approved raw materials.
2. This resin is a recognized component for UL 1746 applications.
3. Elastomer modified vinyl ester resin.
4. Provides flame spread of less than 75 unfilled and less than 25 filled with 3% antimony trioxide by ASTM E84 tunnel test.
5. Provides flame spread of less than 125 unfilled and less than 25 filled with 5% antimony trioxide by ASTM E84 test.
6. Designed for low smoke applications. Used in combination with alumina trihydrate. Provides flame spread of less than 75 filled with 45% alumina trihydrate by ASTM E84 tunnel test.
7. Not recommended for corrosion applications.
8. Provides flame spread of less than 25 filled with 1.5% antimony trioxide by ASTM E84 tunnel test.
9. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Corrosion Resistant and/or High Strength category.
10. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Corrosion Resistant and/or High Strength category: Mechanical Application method.
11. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Corrosion Resistant and/or High Strength category: Filament Winding Application method.
12. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - High Strength category.
13. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Low Flame Spread/Low Smoke Products category.
14. UL-approved component for UL 1316 applications.
15. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants for Boat Manufacturing."
16. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Non-Corrosion and/or Not High Strength: Mechanical and Filament Winding manufacturing methods.
17. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" requirements for Open Molding - Tooling category.
18. These products are approved by Lloyd's of London for marine applications.
19. Approved by Det Norske Veritas (DNV) for use in marine applications.
20. Heat distortion 270°F (132°C) thixotropic promoted.
21. Infusion resin.
22. Compliant with the EPA 40CFR Part 63 "National Emission Standards for Hazardous Air Pollutants: Reinforced Plastics Composites Production" Requirements for Open Molding - High Strength category (Casting Tensile Strength greater than 10,000 psi).

We believe this information is reliable, but we do not guarantee its accuracy nor do we assume any liability arising out of its use. Thoroughly test any application before commercialization. Our recommendations should not be taken as inducements to infringe any patent or violate any law, safety code or insurance regulation.



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