

# Vinyl Ester Resin Guide

To Corrosion Resistant Vipel<sup>®</sup> Resins



# Vipel® Vinyl Ester Leadership

AOC is the new leader in vinyl ester corrosion-resistant and flame retardant resin technology. Building on its long expertise in the corrosion-resistant equipment sector, AOC has created a comprehensive line of Vipel® vinyl ester chemistries to take on the most demanding specifications.

The expansion of the Vipel resin family reflects AOC's understanding that corrosion-resistant equipment fabrication involves complex issues that are best addressed with a range of resin options. Instead of pushing specifiers and manufacturers toward a limited range of resins we want to make, we can offer the chemistry that best meets their needs.

**Table 1. Vipel® Vinyl Ester Resin Overview**

Product Designation	Resin Description	Application Guidelines
F010	Bisphenol A, Epoxy Vinyl Ester	Ideally suited for use in hand lay-up, spray-up, filament winding, SMC and pultrusion processes where outstanding mechanical properties and excellent resistance to chemicals and heat are required.
F013	Bisphenol A, Epoxy Vinyl Ester	Higher Styrene content version of Vipel F010
F007	Low VOC/HAP version of Vipel F010.	Excellent resistance to acids and alkalis
F015	Low VOC/HAP vinyl ester resin	Designed for closed mold process such as RTM, pultrusion and compression molding. It is not designed for open molding.
F017	Elastomeric, Bisphenol A, Epoxy Vinyl Ester	For bonding and improved interlaminar adhesion For composites needing added flexibility
F085	Epoxy, Novolac Vinyl Ester	Exceptional resistance to solvents High temperature resistance

**Table 2. Vipel® Flame Retardant Vinyl Ester Resin Overview**

Product Designation	Resin Description	Application Guidelines
K026-A & PT	Bisphenol A, Epoxy Vinyl Ester	Class I flame and smoke rating without synergist Excellent corrosion resistance
K022-AC	Bisphenol A, Epoxy Vinyl Ester	Class I flame rating without synergist Excellent corrosion resistance
K022-C	Bisphenol A, Epoxy Vinyl Ester	Class I flame rating w/1.5% antimony trioxide Excellent corrosion resistance
K022-CN	Bisphenol A, Epoxy Vinyl Ester	Contains antimony compounds Class I flame rating without additional synergists
K023	Low VOC/HAP, High Cross-Linked, Bisphenol A, Epoxy Vinyl Ester	Class I flame rating without synergist content <35% HAP (styrene) Excellent resistance to oxidizing chemicals High temperature resistance
K095	Epoxy, Novolac Vinyl Ester	Class I flame and smoke rating Excellent for pulp and paper industry Exceptional resistance to severe environments





# Compare the Difference with Vipel:

Table 3. Properties of AOC and Competitive Vinyl Ester Resins

	Bisphenol A Epoxy Vinyl Ester						Low VOC Bisphenol A Epoxy Vinyl Ester			Elastomer A
	AOC	AOC	Ashland	Ashland	Interplastic	Reichhold	AOC	Ashland	Ashland	A
	Vipel	Vipel	Hetron	Derakane	CoRezyn	Dion	Vipel	Hetron	Derakane	V
	F010	F013	922	411 M	8300	9100	F007	942	441	F
Castings:										
Flexural Strength, psi	22,200	21,800/150	20,500	22,000	19,400	23,000	23,600	22,100	21,000	15
Flexural Modulus, psi	500,000	530,000/3.7	500,000	490,000	450,000	500,000	560,000	530,000	500,000	40
Tensile Strength, psi	12,800	12,800/88	12,500	12,000	11,600	11,600	13,800	13,300	13,000	8
Tensile Modulus, psi	460,000	470,000/3.2	460,000	460,000	470,000	460,000	520,000	520,000	480,000	38
Elongation, %	6.2	6.6	6.7	5.5	5	5.2	5.1	5.5	5.5	
Heat Distortion Temperature, °F	248	232	221	220	210	220	266	250	245	2
Barcol Hardness (934)	39	34	30	35	34	35	44	45	35	
Casting Cure System - See Note:	1	1	3	5	6	6	3	3	5	
Liquid Properties:										
Specific Resin	F010-CNM-00	F013-AAB-00	922	411-350 M	8300	9100-20	F007-AAA-00	942	441-400	F017
Viscosity (Brookfield), cps	300	450	450	350	500	350	400	450	400	3
Specific Gravity	1.05	1.05	1.05	1.05	1.03	1.04	1.09	1.09	1.07	1
Styrene Content, %	40	43	45	45	40	45.5	32	35	33	

Table 4. Physical Properties of AOC and Competitive Fire Retardant Vinyl Ester Resins

	Bisphenol A Epoxy Vinyl Ester								Low Styrene High Cross-Linked Bisphenol A Vinyl Ester		Epoxy Novolac Vinyl Ester	
	AOC	AOC	Dow	AOC	Ashland	Ashland	Interplastic	Reichhold	AOC	Ashland	AOC	Ashland
	Vipel	Vipel	Derakane	Vipel	Hetron	Derakane	CoRezyn	Dion	Vipel	Hetron	Vipel	Derakane
	K026-AA	K022-AC	510 A	K022-C	FR 992	510 C	8440	9300	K023	998/35	K095	510 N
Castings:												
Flexural Strength, psi	22,500	21,300	21,700	20,700	21,000	22,000	19,500	21,900	17,500	22,000	23,000	19,000
Flexural Modulus, psi	537,000	530,000	522,000	530,000	520,000	490,000	470,000	520,000	600,000	570,000	570,000	530,000
Tensile Strength, psi	13,000	12,500	12,300	12,000	13,000	12,000	12,750	11,500	13,200	13,500	13,400	10,500
Tensile Modulus, psi	522,000	520,000	493,000	520,000	500,000	460,000	470,000	510,000	540,000	530,000	540,000	500,000
Elongation, %	4.0	4.0	4.5	4.6	4.6	5.5	2.5	4.0	4.3	4.0	3.6	3.5
Heat Distortion Temperature, °F	230	241	220	234	227	220	225	230	265	275	289	250
Barcol Hardness (934)	38	39	40	40	35	35	35	40	46	40	42	40
Casting Cure System - See Note:	1	1	6	1	3	6	6	6	1	3	2	5
Laminates:												
ASTM E 84 Flame Spread												
without Antimony Trioxide	20	25	20	≤ 30	≤ 75	50	≤ 25	≤ 25	15	≤ 25	25	75
with 1.5% Antimony Trioxide				20								
with 3% Antimony Trioxide			10		≤ 25	20						20
with 5% Antimony Trioxide			10			15						15
Liquid Properties:												
Specific Resin	K026-AAA-00	K022-ACA-00	510A-40	K022-CCC-00	992	510C-350	8440	9300-00	K023-AAA-00	998/35	K095-AAA-00	510N
Viscosity (Brookfield), cps	400	450	325	450	425	350	500	450	250	475	250	240
Specific Gravity	1.25	1.16	1.23	1.16	1.17	1.14	1.17	1.17	1.29	1.22	1.17	1.15
Styrene Content, %	38	39	38	39	40	35	40	41.5	28	35	35	37

Notes

1. Gelled with 1.0% BPO and post cured at 160°F for four hours, one hour at 200°F, one hour at 240°F and two hours at 280°F

2. Gelled with 1.0% BPO and post cured at 160°F for four hours, one hour at 200°F, one hour at 240°F, and two hours at 280°F and two hours at 300°F

3. Gelled with 1.0% BPO and post cured at 160°F for two hours, one hour at 200°F, and two hours at 280°F

4. No information on promoter or catalyst. Cured for 24 hours at room temperature and then two hours at 300°F

5. No information on promoter or catalyst. Cured for 24 hours at room temperature and then two hours at 250°F

6. Cure schedule was not specified in the literature

7. AOC test as 4 above

# Vipel® Teamwork

A Vipel resin purchase is so much more than a shipment of resin. It's your link to research scientists who listen to fabricators and specifiers to determine where the next evolution in resin technology should go. You connect with professionals in ISO 9001:2008-certified facilities using proprietary controls that ensure fitness-for-use requirements are consistently achieved in every resin batch. And you have access to the industry's most knowledgeable corrosion technicians who can help customize formulations that target your requirements.

For composites that require structural strength, flame retardance and high resistance to aggressive environments, choose the vinyl ester leader. Contact the AOC Corrosion Specialist in your region. Go to [www.corrosionresins.com](http://www.corrosionresins.com) or phone (866) 319-8827.

Isophenol Vinyl Ester		Epoxy Novolac Vinyl Ester				Enhanced Novolac Epoxy Vinyl Ester	
Ashland	AOC	Ashland	Ashland	Interplastic	Reichhold	AOC	Ashland
Derakane	Vipel	Hetron	Derakane	CoRezyn	Dion	Vipel	Derakane
8084	F085	970/35	470-300	8730	9480	F086	470HT
19,000	21,500	16,100	19,000	18,000	20,500	16,800	22,000
480,000	540,000	560,000	550,000	480,000	510,000	620,000	510,000
11,000	11,200	11,700	12,500	11,000	9,000	10,000	12,000
420,000	540,000	520,000	520,000	500,000	500,000	550,000	510,000
9	3.3	3.2	3.5	2.5	3	2.4	3
180	300	300	300	266	260	330	330 (7)
30	44	45	40	44	38	41	40
5	2	4	5	6	6	3	6
8084	F085-AAA-00	970/35	470-300	8730	9480-00	F086-AAA-00	470HT
350	300	360	300	350	450	400	400
1.02	1.08	1.07	1.08	1.03	1.04	1.08	1.08
40	34	34	33	37	40	35	33



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Hetron® is a registered trademark of Ashland, Inc.  
Vipel® is a registered trademark of AOC, LLC

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AOC is a leading global supplier of resins, gel coats, colorants, additives, B-sides and synergistic material systems for composites and cast polymers. AOC products are manufactured in facilities strategically located in North America, Europe and Asia to serve markets throughout the world. AOC believes that success lies in innovative research, world-class quality and a commitment to technical support that improves customer quality, productivity and competitiveness.

**[www.corrosionresins.com](http://www.corrosionresins.com)**

The Internet's best resource  
on corrosion-resistant composites



# THE WORLD OF



*World Leader in Resin Technology*

AOC is a leading producer of unsaturated polyester and vinyl ester resins and is the world leader in innovative resin technology. AOC manufactures its products in facilities strategically located throughout North America and Europe. AOC owned facilities are ISO 9001:2008 certified and use AOC's proprietary process control technology to guarantee batch to batch consistency.

From isophthalic polyesters, and terephthalics, to epoxy novolac and bisphenol A vinyl esters, AOC offers local availability, worldwide, of a broad range of proven Vipel resins through its network of distributors and plants. Please contact the AOC Corrosion Specialists for Vipel resins that meet your corrosion resistant specifications, and put the technology and service of the AOC Corrosion Team to work for you.

## **CORROSIONRESINS.com**

The internet's best resource on corrosion-resistant composites.

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