



**Your Formula for Success**  
RESINS | GEL COATS | COLORANTS

## FIREPEL® K133 SERIES POLYESTER RESIN



# Product Information

## POLYESTER RESIN FOR FILLED FIRE RETARDANT APPLICATIONS

Typical Cast Mechanical Properties <sup>1</sup>			
Test	Unit of Measure	Nominal	Test Method
Tensile Strength	psi/MPa	9,900/68	ASTM D638 / ISO 527-1
Tensile Modulus	psi/GPa	490,000/3.4	ASTM D638 / ISO 527-1
Tensile Elongation	%	2.4	ASTM D638 / ISO 527-1
Flexural Strength	psi/MPa	15,400/106	ASTM D 790 / ISO 178
Flexural Modulus	psi/GPa	550,000/3.8	ASTM D 790 / ISO 178
Heat Distortion Temp.	°F/°C @264 psi	185/85	ASTM D648 / ISO 75-A
Barcol Hardness		45	ASTM D2583 / EN 59

Typical Liquid Properties <sup>2</sup>						
VERSIONS	Viscosity cps	Thix Index	Gel Time Min	Gel to Peak Min	Peak Exotherm (°F/°C)	Specific Gravity
K133-AAA-00	18 <sup>1</sup>	NA	8 <sup>2</sup>	5	375/191	1.05
K133-ATT-00	100 <sup>4</sup>	3 <sup>5</sup>	8 <sup>2</sup>	5	375/191	1.05

- 1) 77°F/25°C Brookfield RV viscosity spindle 1 at 50 rpm
- 2) 180°F/82°F SPI Gel with 1.0% BPO
- 3) 77°F/25°C Gel time with 2.0% MEKP
- 4) 77°F/25°C Brookfield RV viscosity spindle 2 at 20 rpm
- 5) 77°F/25°C Thix Index 2/20

Promoter/Catalyst Systems at 77 °F/25 °C for K133-AAA-00 and K133-ATT-00		
Resin	100	100*
Cobalt 6%,phr	0.6	-
N,N-Dimethyl aniline, phr	0.2	0.2
ATH, phr	150-160	150-160
MEKP, phr	2	-
Dibenzoyl peroxide (BPO 98% active) , phr **	-	2
Gel time, minutes	30	38

\*Preferred System

\*\*Adjust to concentration of BPO to be used.

Typical properties are not to be construed as specifications.

### DESCRIPTION

Firepel K133 series resins are specifically designed to be blended with alumina trihydrate (ATH) to provide fire retardant properties.

### APPLICATION

Firepel K133-ATT-00 is thixotropic to keep the ATH in suspension longer. ATH is needed to provide fire retardant properties.

Flammability of composite parts is dependent on the geometry of the part, degree of cure, reinforcement content, types of reinforcement, etc. It is the end user's responsibility to ensure that finished parts meet the required specifications. Published flammability properties should be used for comparison purposes only.

### BENEFITS

#### Fire Retardant

Laminates made with Firepel K133 series have passed the UL 94-HB, UL 94-5V and UL 94-V-0 test requirements. Laminates were made with a blend of 40/60 resin/ATH and 2 plies of 1.5 oz/450 grams/m<sup>2</sup> chopped strand mat. (The glass content was 22.5%)

#### Toxicity

Composites made with Firepel K133 series resins have low toxicity values due to the absence of halogens.

#### Low Cost

Economical Fire Retardant composites can be made with Firepel K133 series resins.



### Flammability Properties vs. Laminate Thickness

#### ASTM E 84 Tunnel Test

ATH phr	ATH % Resin Mix	% Glass	Composite Thickness	Flame Spread	Smoke Developed
150	60%	16%	0.075"	25	65
160	61.5%	19%	0.20"	20	195
160	61.5%	23%	0.29"	25	150

NOTES: "phr" = Parts per Hundred Weight

All Laminates were post cured at 212°F/100°C for at least 5 hours.

### Filler Guidelines for 150-160 phr ATH Resin Mixes

The particle size of the ATH filler will have a dramatic affect on the viscosity of the filled system. It has been determined that a 50:50 blend of two different particle size grades of ATH will provide the optimum balance of processing and reduce the tendency for the filler to settle. Alternate grades at similar mean particle size may be considered. Some grades of ATH may affect the reactivity of the filled resin mixture, so it is advised to characterize the specific grade of ATH before committing to production.

ATH Grade			ATH Resin Mixes	
Particle Size	Median Particle Size	Examples	150 phr	160 phr
Fine	2 - 4 um	Huber SB632, RJ Marshal A202	30%	30.75%
Coarse	15 - 16 um	Huber SB336, RJ Marshal AH280	30%	30.75%
<b>K133-A Series Resin</b>			40%	38.5%
Sum			100%	100%

NOTE: "phr" = Parts per Hundred Weight





**PROPERTIES OF COMPOSITES AT 150 PHR ATH**

Flame Retardant & Smoke Development Data (See Note Below) **			
NFA 258 Smoke Development (ASTME 662-97 Smoke Density Chamber)			Flame Spread Rating (ASTME 162-98)
	Flaming	Non-Flaming	20
D m	61	40	
Ds 1.5	1	0.2	
Ds 4.0	16	2	

ASTM E 1354 Results** Oxygen Consumption Calorimeter with 50k W/m2	
TEST	RESULTS
Time to sustained ignition, seconds	63
Average peak heat release rate, kw /m2	340
Average heat release rate after 60 seconds, k w /m2	235
Average heat release rate after r 180 seconds , kw /m2	138
Average heat release rate after 300 seconds , kw /m2	104
Total heat release, mj/m2	27
Average effective heat of combustion, mj/kg	17
Smoke obscuration, average specific extinction area, m2 /kg	430
Mass loss, %	51

Toxic Gas Generation Based on Boeing Specification Support Standard BSS 7239 Sampling 4 minutes after initiation of the test**		
Gas	Flaming Mode	No n-Flaming Mode
Hydrogen Cyanide (HCN) , ppm	<2	<2
Carbon Monoxide ( CO) , ppm	67	<10
Nitrous Oxides ( NOx ) ppm	<2	<2
Sulfur Dioxide ( SO2) , ppm	<1	<1
Hydrogen Fluoride ( HF) , ppm	<1.5	<1.5
Hydrogen Chloride (HCL) , ppm	4	2

\*\*Laminates contained 16% fiberglass and were post cured at 212°G/100°C for 3 hours.





### FILLER GUIDELINES FOR 300 PHR ATH RESIN MIXES

Only Martinal ON-921 grade ATH has been tested and found to yield a workable viscosity at 300 phr level (~600 cps). Alternate grades of ATH may be suitable but it is advised to characterize the specific grade of ATH before committing to production.

**NOTE:** Albemarle and Martinal are Registered Trademarks of Albemarle, Corp.

### PROPERTIES OF COMPOSITES AT 300 PHR ATH

	British Standard Testing			
	BS : 6853		BS : 476 Part-6	BS : 476 Part-7
	Smoke Density, Annexure D clause D.8.4 Panel Test	Toxic fume, Annex - B, Clause-B.2	Fire Propagation Index	Surface spread of flame
<b>Test Results</b>	Ao (On) / Ao (Off)	R	I	Class
	1.96 / 2.65	0.4	Class "O" (i= 6.8)	Class-1
<b>Formulations</b>	PHR	PHR	PHR	PHR
<b>Firepel K133-AAA-00</b>	100	100	100	100
<b>Promoter K*</b>	4	4	4	4
<b>BYK - W 996 **</b>	9	9	9	9
<b>Aluminum in hydroxide (Martinal® ON-921)***</b>	300	300	300	300
<b>MEKP</b>	8	8	8	8
<b>Glass Reinforcement</b>	3 Plies of 300g/m <sup>2</sup> chopped strand m at 2 Plies of 600g/m <sup>2</sup> woven roving			
<b>Resin glass ratio.</b>	3.5	3.5	3.5	3.5
<b>Post Cure</b>	100 °C for 5 hrs.	100 °C for 5 hrs.	100 °C for 5 hrs.	100 °C for 5 hrs.



# FIREPEL®

## K133 SERIES POLYESTER RESIN



### PERFORMANCE GUIDELINES

A. Keep full strength catalyst levels between 1.0% - 2.0% of the total resin weight.

B. Maintain shop temperatures between 65°F/18°C and 90°F/32°C and humidity between 40% and 90%. Consistent shop conditions contribute to consistent gel time and will help the fabricator make a high quality part.

### STORAGE STABILITY

This product is stable for three months from the date of manufacture when stored in the original containers, away from direct sunlight or other UV light sources and at or below 77°F/25°C.

After extended storage, some drift may occur in the product viscosity and gel time.

### SAFETY

A. See appropriate Material Safety Data Sheet for guidelines.

B. Chemical resistance studies have indicated the dicyclopentadiene resins such as the Firepel K133 Series resins have inferior resistance to certain hydrophobic liquids, such as hydrocarbons. Fuel storage tanks should not be produced with the Firepel K133 Series resins. If your manufacturing needs require a more corrosion resistant resin, please contact your AOC representative for information or technical assistance on AOC's line of isophthalic or vinyl ester resins.

### APPLICATION GUIDELINES

A. Due to the curing characteristics of the Firepel K133 series resin, it is desirable to complete all secondary bonding as soon as possible. Exposure of the laminate to sunlight will result in severe secondary bonding problems. After 24 hours of cure, it may become necessary to abrade the laminate to ensure good secondary bonding, especially if the surface of the laminate has been allowed to become resin rich. Low fiberglass content and resin puddling should be avoided with this product.

B. To assure adequate bonding to gel coats, fabricators should pre-wet the gel coat surface with a thin pass of catalyzed resin prior to lamination.

### ISO 9001:2008 CERTIFIED

The Quality Management Systems at every AOC manufacturing facility have been certified as meeting ISO 9001:2008 standards. This certification recognizes that each AOC facility has an internationally accepted model in place for managing and assuring quality. We follow the practices set forth in this model to add value to the resins we make for our customers.

### FOOTNOTES

(1.) Based on tests of Firepel K133-AAA-00 resin at 77°F/25°C and 50% relative humidity. Thixotropic components, if applicable, are excluded. Castings were prepared using 1.0% BPO and post cured 1 hour at 93°C, 1 hour at 116°C and 2 hours at 138°C.

(2) The gel times shown are typical but may be affected by catalyst, promoter, inhibitor concentration, resin, mold, and shop temperature. Variations in gelling characteristics can be expected between different lots of catalysts and at extremely high humidities. Pigment and/or filler can retard or accelerate gelation. It is recommended that the fabricator check the gelling characteristics of a small quantity of resin under actual operating conditions prior to use.

#### Note:

\*Promoter K is a product of AOC LLC.

\*\*BYK is a register trademark of BYK-Chemie GmbH,

\*\*\*Martinal is a register trade mark of Albemarle corporation Germany.



Your Formula for Success  
RESINS | GEL COATS | COLORANTS

### AOC World Headquarters

955 Highway 57 East, Collierville, TN 38017

+01 901.854.2800

[AOC-Resins.com](http://AOC-Resins.com)

Pub. K133 SERIES NA  
Effective Date: Feb. 2017  
Copyright © 2017

### SALES CONTACTS

#### NORTH AMERICA

Toll free: +1 866 319 8827  
[northamerica@aac-resins.com](mailto:northamerica@aac-resins.com)

#### LATIN AMERICA

+01 863 815 5016  
[latinamerica@aac-resins.com](mailto:latinamerica@aac-resins.com)

#### MIDDLE EAST

+44 1206 390415  
[middleeast@aac-resins.com](mailto:middleeast@aac-resins.com)

#### EUROPE

+44 1206 390415  
[europa@aac-resins.com](mailto:europa@aac-resins.com)

#### AOC UK LTD.

+44 01206 390400  
[salesUK@aac-resins.com](mailto:salesUK@aac-resins.com)

#### INDIA

+44 1206 390415  
[india@aac-resins.com](mailto:india@aac-resins.com)

#### ASIA/AUSTRALIA

+44 1206 390415  
[asia@aac-resins.com](mailto:asia@aac-resins.com)

AOC is a registered trademark of AOC, LLC.

The information contained in this data sheet is based on laboratory data and field experience. We believe this information to be reliable, but do not guarantee its applicability to the user's process or assume any liability for occurrences arising out of its use. The user, by accepting the products described herein, agrees to be responsible for thoroughly testing each such product before committing to production. Our recommendations should not be taken as inducements to infringe any patent or violate any law, safety code or insurance regulation. Data Sheet and its contents are the confidential and proprietary information of AOC and it may not be modified altered deconstructed or presented in any other manner without the explicit authorization of AOC and/or its legal counsel.