



Technical Data Sheet

**PARALOID™ AE-1285 Acrylic Curing Agent**  
For Isocyanate-Free, High-Solids, Durable Topcoats

Introduction

PARALOID™ AE-1285 Acrylic Curing Agent is a high solids acrylic resin that can be formulated with epoxy resins to a VOC at or below 3.5 lbs/gallon (420 grams/liter) in ambient cure formulations. Two component, high performance topcoats, formulated with liquid "aromatic" Bisphenol A type epoxy resins such as Araldite GY-6010 modified polyamidoamine, offer a lower cost alternative to acrylic urethanes with similar performance.

When PARALOID™ AE-1285 Acrylic Curing Agent is used with "aliphatic," sorbitol based epoxy resins such as Erisys GE-60 epoxy resin, a unique balance of properties is obtained which may be of interest to the epoxy formulator. Specifically, the coatings are more flexible and develop their ultimate properties faster. While early results indicate that coatings containing PARALOID™ AE-1285 Acrylic Curing Agent with Erisys GE-60 epoxy resin are not as durable as coatings containing aromatic type epoxy resin, they are still significantly more durable than coatings based on non-acrylic curing agents with Erisys GE-60 epoxy resin.

Key Features and Benefits

Feature	Coating Benefit	User Benefit
Acrylic Composition	Light Stable for Long Lasting Performance	Reduced Need to Repaint
High Solids	Lower VOC	Compliance with VOC Regulations
Crosslinking at Ambient Temperature	Force Drying or Baking Not Required	Can Be Used Where Acrylic Urethanes Are Currently Used

Typical Physical Properties<sup>1</sup>

Property	Typical Values
Nonvolatile Content, % (ASTM, 1 hr @ 100°C)	70
Viscosity, cPs (25°C)	5000
Solvents, Ratio, % As Supplied	
Xylene	70
Butanol	30
Active Hydrogen Equivalent Weight	
Solids Basis	1145
As Supplied	1636
Density, lbs/gal	
Solids Basis	8.95
As Supplied	8.4

1. These properties are typical but do not constitute specifications.

## Light Stabilizers

Hindered amine light stabilizers (HALS), such as Tinuvin 292 liquid light stabilizer, are essential additives for these acrylic epoxy formulations. A starting point level of 2% based on total resin solids has significantly improved the color and gloss retention in exposure tests.

## Epoxy Resin Selection

Although PARALOID™ AE-1285 Acrylic Curing Agent would react with a wide variety of glycidyl-ether-functional resins, our initial formulation studies focused on the liquid types described in Table 1 below.

Exposure studies to date indicate that coatings based on PARALOID™ AE-1285 Acrylic Curing Agent and either epoxy have very good durability. The first and oldest exposure of a PARALOID™ AE-1285 Acrylic Curing Agent prototype found the "aromatic" epoxy to have better appearance durability than the "aliphatic" epoxy.

Table 1

Epoxy Crosslinker	Type	Effect on Performance
Araldite GY-6010 modified polyamidoamine	Bisphenol A "Aromatic"	Better Direct-to-Metal Corrosion Protection
Erisys GE-60 epoxy resin	Sorbitol Polyglycidyl Ether "Aliphatic"	Develops Properties Faster, Imparts More Flexibility

## Performance of Deeptone Blue Acrylic Epoxy Coatings

This study was done in deeptone blue formulations and it demonstrates the value of adding a light stabilizer to the formulation. Durability is determined by natural weathering versus various accelerated laboratory tests. Results are presented in Table 2 below.

Table 2

Coating Type	Acrylic Epoxy		Acrylic Urethane	Polyamide Epoxy	
Curing Agent	PARALOID™ AE-1285 Acrylic Curing Agent		PARALOID™ AU-608 Acrylic Polyol	HY 283	
Type	Acrylic		Acrylic Polyol	Polyamidoamine	
Crosslinker	Epon 828 epoxy resin	Erisys GE-60 epoxy resin	Desmodur N-3300 hardener	Epon 828 epoxy resin	Erisys GE-60 epoxy resin
Type	"Aromatic" Epoxy	"Aliphatic" Epoxy	Isocyanate	"Aromatic" Epoxy	"Aliphatic" Epoxy
Initial 20° Gloss	86	88	80	85	88
<b>Natural Weathering</b>					
20° Gloss, without/with 2% Tinuvin 292 liquid light stabilizer					
<b>Florida, Black Box, South 5°</b>					
6 months	84/84	79/81	70/78	25/15	74/68
11 months	64/69	40/53	-	0/0	0/0
17 months	52/64	10/30	48/54	Chalking	0/0
28 months	1/34	1/1	23/30	Eroding	Eroding
<b>Seabrook, NJ, South 45°</b>					
17 months	62/71	42/42	66/67	0/0	0/0
28 months	32/42	10/14	39/39	Eroding	Chalking
<b>Accelerated Weathering QUV (UVB-313)</b>					
375 hrs.	4/25	54/85	76/77	0/0	0/0
772 hrs.	1/2	1/39	71/74	Chalking	Eroding
<b>Weather-O-Meter (Xenon Arc)</b>					
2100 hrs.	51/65	49/70	68/69	0/0	14/23
3500 hrs.	14/43	21/23	65/68	0/0	1/4

## Catalyst and Co-Curing Agents

PARALOID™ AE-1285 Acrylic Curing Agent contains a catalyst which gives it better reactivity and less water sensitivity than would be afforded by adding a less permanent catalyst to the formulation. Non-volatile amines and polyamides, however, can be useful co-curing agents for PARALOID™ AE-1285 Acrylic Curing Agent. Table 3 contains a summary of the effects determined in our laboratory for co-curing agents evaluated to date.

All the amine co-curing agents are less weatherable than the acrylic, so there is some loss in durability. Better durability is expected with saturated polyamide resins such as Henkel's Versamid 1540 resin.

Table 3

Co-Curing Agent	Viscosity, cPs @ 100% Solids	Type	Effect on Performance
Hardener HY 283	4000	Modified Polyamidoamine	<ul style="list-style-type: none"> <li>• Improves solvent resistance</li> <li>• Increases flexibility and impact resistance of unweathered films</li> </ul>
Hardener Araldite HY 360	240	Modified Polyamidoamine	<ul style="list-style-type: none"> <li>• Improves solvent resistance</li> <li>• Does not improve flexibility</li> <li>• Slows the dry times</li> <li>• Lowers the VOC</li> </ul>
Hardener HY 2964	50	Modified Aliphatic Amine	<ul style="list-style-type: none"> <li>• Harder and less flexible films</li> <li>• Does not slow the dry nor yellow the films as much as the polyamidoamines</li> <li>• Lowers the VOC</li> </ul>

## Performance of Black Acrylic Epoxy Coatings

The performance of black topcoats based on PARALOID™ AE-1285 Acrylic Curing Agent, with and without Hardener HY 283, is demonstrated in aromatic (Araldite GY-6010 epoxy resin) and aliphatic (Erisys GE-60 epoxy resin) screening formulations.

The durability of these black topcoats, with and without Hardener HY 283, is also demonstrated. Data are presented in Table 4 (Page 4).

The durability of these black topcoats, with and without Hardener HY 283, is demonstrated in the results of actual exposure in black box South 5° in Florida and accelerated QUV exposure. The black screening formulations contained the light stabilizer Tinuvin 292 liquid light stabilizer at the 2% level. The contribution of the acrylic to durability is clearly demonstrated. See Table 5 (Page 5).

Standard QUV tests utilizing UVB-313 bulbs are not good predictors of exterior performance. This is particularly evident in the gloss retention of Bisphenol A ("aromatic") epoxies cured with PARALOID™ AE-1285 Acrylic Curing Agent. This QUV test predicts that these coatings have much poorer durability than acrylic urethanes, whereas exposure tests to date suggest comparable durability. QUV results utilizing the UVA-340 bulbs which lack the UVB wavelengths seem to be better predictors of the weathering properties of these acrylic epoxy coatings relative to other coating systems. Accelerated weathering testing with the xenon-arc Weather-O-Meter is also preferable to the QUV/UVB tests.

Table 4

Epoxy Crosslinker	Formulation	Formulation	Formulation	Formulation	High Solid Acrylic Urethane
	G-1285-1	G-1285-2	G-1285-3-	G-1285-4	
Erisys GE-60 epoxy resin					
Araldite GY-6010 epoxy resin					
Modified Polyamidoamine Co-Curing Agent	None	HY-283	None	HY-283	
<b>Application Characteristics</b>					
Pot Life Viscosity (cPs)	290	280	270	280	270
After 2 hrs.	420	450	345	390	420
After 4 hrs.	500	580	465	500	580
Dry Speed					
Dry to Touch	0.5	1.5	0.5	1.2	1.0
Tack Free (100g)	1.7	2	1.0	2	3
Dry Hard (500g)	> 6	> 6	6	> 6	> 6
Early Water Fog Resistance % 60 Gloss Retention after 8 hrs. Rain Films Dried for:					
1 day @ 75°F	95	97	89	93	98
2 days @ 47°F	96	95	64	44	90
MEK Rub Resistance					
7 days @ 47°F	140	> 200	125	200	> 200
7 days @ 75°F	> 200	> 200	> 200	> 200	> 200
<b>Properties after 14 Days @ 75°F</b>					
Hardness					
KHN	2.1	2.0	6.6	6.6	3.0
Pencil	H	H	2H	2H	H
Impact Resistance					
Direct	80	> 140	30	30	> 140
Reverse	14	> 140	2	4	120
Chemical Resistance Spot Test Appearance after 24 hrs. Exposure and 24 hr. Recovery					
10% Acetic Acid	Blister	Lift	Blister	Blister	OK
10% Hydrochloric Acid	OK	Lift	OK	OK	OK
Xylene (1 hr. Exposure)	OK	OK	OK	OK	OK

Table 5

	Formulation G-1285-1	Formulation G-1285-2	Formulation G-1285-3-	Formulation G-1285-4	No Acrylic	High Solid Acrylic Urethane
Epoxy Crosslinker	Erisys GE-60 epoxy resin		Araldite GY-6010 epoxy resin			
Modified Polyamidoamine Co-Curing Agent Durability 60°/20° Gloss Initial	None 94/87	HY-283 95/90	None 97/92	HY-283 98/95	HY-283 90/83	95/88
<b>Natural Weathering</b>						
Florida, Black Box, South 5° 6 months	89/80	88/73	89/78	89/76	7/1	89/81
<b>Accelerated Weathering</b>						
QUV (UVB-313)						
648 hrs.	84/61	65/21	46/9	38/4	0/0	89/77
935 hrs.	61/41	48/9	40/5	20/1	0/0	88/76
QUV (UVA-340)						
625 hrs.	90/83	88/74	92/86	90/78	77/45	90/83
911 hrs.	90/83	86/70	92/85	89/74	12/1	90/83
1436 hrs.	90/83	85/67	91/83	89/75	1/0	90/83
2011 hrs.	89/80	84/61	89/77	87/69	0/0	90/82

Table 6: Black Acrylic Epoxy Enamels Based on PARALOID™ AE-1285 Acrylic Curing Agent Screening Formulations

Materials	Formulation G-1285-1		Formulation G-1285-2		Formulation G-1285-3		Formulation G-1285-4	
	Lbs	Gal	Lbs	Gal	Lbs	Gal	Lbs	Gal
<b>Acrylic Component "A"</b>								
<i>Sand Grind:</i>								
PARALOID™ DM-55 Solid Grade Thermoplastic Acrylic Resin (100%)	25.6	2.88	25.6	2.88	25.6	2.88	25.6	2.88
Acrosolv PM acetate	89.7	11.12	89.7	11.12	89.7	11.12	89.7	11.12
Raven 420 carbon black	25.6	1.75	25.6	1.75	25.6	1.75	25.6	1.75
<i>Letdown:</i>								
PARALOID™ 1285 Acrylic Curing Agent (70%)	555.1	66.08	457.4	54.45	551.2	65.62	453.6	4.00
Hardener HY-283 (100%)	-	-	25.6	4.26	-	-	35.3	4.23
Butanol	64.8	9.60	95.7	14.17	63.7	9.43	93.2	13.81
SF1023 silicone (Flow Aid)	0.6	0.07	0.6	0.17	0.6	0.07	0.6	0.07
Tinuvin 292 liquid light stabilizer (HALS)	9.2	1.11	9.2	1.11	9.2	1.11	9.2	1.11
<b>Sub Total:</b>	<b>770.6</b>	<b>92.61</b>	<b>739.4</b>	<b>89.81</b>	<b>765.6</b>	<b>91.98</b>	<b>732.8</b>	<b>88.97</b>
<b>Epoxy Crosslinker, Component "B"</b>								
Erisys GE-60 epoxy resin (100%)	78.3	7.39	108.0	10.19	-	-	-	-
Araldite GY-6010 epoxy resin (100%)	-	-	-	-	77.8	8.02	107.0	11.03
<b>Totals:</b>	<b>848.9</b>	<b>100.00</b>	<b>847.4</b>	<b>100.00</b>	<b>843.00</b>	<b>100.00</b>	<b>839.8</b>	<b>100.00</b>
<b>Formulation Constants</b>								
Weight Solids, %	62.2		61.9		62.2		61.9	
Volume Solids, %	56.6		56.0		56.9		56.4	
Resin Solids, %								
Acrylic	83		68.7		83		68.7	
Polyamide HY-283	-		-		-		7.8	
Erisys GE-60 epoxy resin	17		23.5		-		-	
Araldite GY-6010 epoxy resin	-		-		17		23.5	
Initial Viscosity (ICI; cps)	425		430		460		470	
Pigment Volume Concentration, %	3							
Pigment/Binder Ratio	5/95							
Stoichiometry	1.25 /1 epoxy to activate H+ equivalents		1.25 /1 epoxy to activate H+ equivalents		1.25 /1 epoxy to activate H+ equivalents		1.25 /1 epoxy to activate H+ equivalents	
Calculated VOC, lb/gal	3.2							
Tinuvin 292 liquid light stabilizer (HALS), %	2							

Performance of  
White Acrylic  
Epoxy Coatings

The performance of white topcoats based on PARALOID™ AE-1285 Acrylic Curing Agent, with and without hardeners Araldite HY-360 modified polyamidoamine and Araldite HY-2964 modified aliphatic amine, is demonstrated in aromatic (Araldite GY-6010 epoxy resin) screening formulations. See Table 7 below.

Table 7

Epoxy Crosslinker	High Solids Acrylic Epoxy			High Solid Commercial Epoxy Topcoat
	Formulation G-1285-5	Formulation G-1285-6 Araldite GY-6010 epoxy resin	Formulation G-1285-7	
Co-Curing Agent	No	Araldite HY-360 Modified Polyamidoamine	HY-2964 Modified Aliphatic Amine	
Pot Life Viscosity (cPs)	140	200	160	140
After 2 hrs.	160	280	210	180
After 4 hrs.	200	300	360	220
Dry Speed, Hours				
Dry to Touch	0.5	>6	4	6
Tack Free (100g)	2	4	>6	>6
Dry Hard (500g)	5	30	>6	>6
Early Water Fog Resistance % 60° Gloss Retention after 8 hrs. Rain on Films Dried for 1 day @ 75°F	54	28	72	60
<b>Properties after 14 Days @ 75°F</b>				
Hardness				
KHN	5.7	8.7	12.9	15.3
Pencil	H	2H	3H	4H
Impact Resistance				
Direct	20	18	10	80
Reverse	2	2	<2	20
Chemical Resistance Spot Test Appearance after 24 hrs. Exposure and 24-hr. Recovery				
10% Sodium Hydroxide	OK	OK	OK	OK
10% Hydrochloric Acid	OK	OK	OK	OK
Xylene (1-hr. Exposure)	OK	OK	OK	OK
Durability, QUV (UVA-340) Gloss Retention (60°/20°)				
Initial Gloss	94/85	96/92	97/92	65/20
After 810 hrs.	82/62	73/40	58/22	2/1
Color Retention (B Value)				
Initial Color	1.1	3.8	1.8	2.5
After 810 hrs.	1.2	4.5	5.2	8.5

Table 8: White Acrylic Epoxy Enamels Based on PARALOID™ AE-1285 Acrylic Curing Agent Formulations

Materials	Formulation G-1285-5		Formulation G-1285-6		Formulation G-1285-7	
	Lbs	Gal	Lbs	Gal	Lbs	Gal
<b>Acrylic Component "A"</b>						
<i>Grind Preparation:</i>						
PARALOID™ AE-1285 Acrylic Curing Agent (70%)	212.6	25.31	256.3	30.51	277.0	32.96
Byk-300 silicone surface additive	2.6	0.33	3.0	0.38	3.0	0.36
Ti-Pure R-960 titanium dioxide	266.6	8.25	320.5	9.92	306.8	9.50
<i>Letdown:</i>						
PARALOID™ AE-1285 Acrylic Curing Agent (70%)	239.9	28.56	46.8	5.57	-	-
Hardener HY-360 (100%)	-	-	69.8	8.62	-	-
Hardener HY-2964 (100%)	-	-	-	-	65.0	8.12
Methyliso Butyl Ketone	49.3	7.39	26.3	3.95	46.8	7.02
Methyl Ethyl Ketone	62.0	9.24	33.2	4.95	28.8	4.29
Tinuvin 292 liquid light stabilizer (HALS)	7.7	0.92	9.2	1.10	9.0	1.08
<b>Totals:</b>	<b>840.7</b>	<b>80.00</b>	<b>765.1</b>	<b>65.00</b>	<b>736.4</b>	<b>63.38</b>
<b>Epoxy Crosslinker, Component "B"</b>						
Araldite GY-6010 epoxy resin (100%)	74.3	7.66	188.5	19.43	198.1	20.42
Arcosolv PM acetate	49.6	6.15	125.5	15.57	130.6	16.20
Methyliso Butyl Ketone	41.3	6.19	-	-	-	-
<b>Sub Total:</b>	<b>165.2</b>	<b>20.00</b>	<b>314.0</b>	<b>35.00</b>	<b>326.7</b>	<b>36.62</b>
<b>Totals:</b>	<b>1005.9</b>	<b>100.00</b>	<b>1079.1</b>	<b>100.00</b>	<b>1065.1</b>	<b>100.00</b>
<b>Formulation Constants</b>						
Weight Solids, %	66.4	74.4	72.8			
Volume Solids, %	52.5	63.2	61.2			
Resin Solids, %						
Acrylic	81	45	42.4			
Polyamide HY-360	-	15	-			
Araldite HY-2964 aliphatic amine	-	-	14.2			
Araldite GY-6010 epoxy resin	19	40	43.5			
Initial Viscosity (ICI; cPs)	140	200	160			
PVC, %	15.7	15.7	15.53			
Calculated VOC, lb/gal	3.38	2.76	2.9			
Stoichiometry (epoxy/active H+)	1.5/1	1.25/1	1.25/1			
Pigment/Binder Ratio	40/60	40/60	40/60			
Tinuvin 292 liquid light stabilizer (HALS), %	2	2	2			



## Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

**CAUTION!** Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

**CAUTION!** Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

## Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

## Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

## Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

### Contact:

North America: 1-800-447-4369  
Latin America: (+55)-11-5188-9000  
Europe: (+800)-3-694-6367  
Asia-Pacific: (+800)-7776-7776  
<http://www.dow.com>

Notice: No freedom from infringement of any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. The product shown in this literature may not be available for sale and/or available in all geographies where Dow is represented. The claims made may not have been approved for use in all countries. Dow assumes no obligation or liability for the information in this document. References to "Dow" or the "Company" mean the Dow legal entity selling the products to Customer unless otherwise expressly noted. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

