

**Formulation – UDW-16**

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## WATER REDUCIBLE POLYESTER/MELAMINE WHITE BAKING ENAMEL

In this formulation, a water reducible polyester/melamine white baking enamel was modified with **K-FLEX® UD-350W** Urethane Diol and with **K-FLEX XM-4306** Polyether Modified Urethane Diol. Compared to the control formula, both modifications improved Humidity, Salt Spray and Boiling Water resistance. Modification also produced harder films, lower viscosity and higher solids. Notice that the melamine level was increased for both modifications to satisfy the higher hydroxyl number of the K-FLEX products.

Formulation		% by Weight		
Material	Description	Control	UD-350W	XM-4306
<b>Grind</b>				
Polymac® WR 72-7203 <sup>1</sup>	Water Reducible Polyester	15.7	17.0	17.1
Triethylamine	Neutralizing Amine	0.5	0.6	0.6
Resimene® 747 <sup>2</sup>	Melamine	4.6	5.1	5.1
Water	Deionized	5.5	6.0	6.0
Dow Corning® 14 <sup>3</sup>	Leveling/Wetting Agent	0.3	0.3	0.3
TiPure® R-960 <sup>4</sup>	Titanium Dioxide	23.1	25.0	25.2
<b>Letback</b>				
Polymac® WR 72-7203	Water Reducible Polyester	9.2	4.6	4.6
Triethylamine	Neutralizing Amine	0.5	0.5	0.5
Modifier	Urethane Diol	0.0	3.4	3.0
Resimene 747	Melamine	0.0	1.0	1.0
Water	Deionized	40.6	36.5	36.6
<b>Total</b>		100.0	100.0	100.0

Paint Properties			
	Control	UD-350W	XM-4306
Viscosity, #2 Zahn, 25°C, seconds			
Initial	95	40	60
2 weeks at 77°F	105	36	37
pH	9.41	9.31	9.80
Theoretical Solids, %	46.4	50.4	50.6
Resin Ratios, Polyester/Mod./Mel.	80/0/20	64/12/24	64/12/24
% Modifier on TRS	0.0	12	12
Pigment to Binder Ratio	1/1	1/1	1/1

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Application Conditions	
Cure Schedule	10 minutes @ 350° F (177° C)
Substrate	Iron Phosphated Steel
Dry Film Thickness	1 +/- 0.1 mil (23 - 28 µ)

Test Results			
	Control	UD-350W	XM-4306
MEK Double Rubs	200+	200+	200+
Gloss, % Reflectance			
20°	35	22	15
60°	73	74	63
Flexibility, Impact, inch*pounds			
Direct	140	80	100
Reverse	80	30	50
König Hardness, Cycles	79	99	86
Tukon Hardness, KHN25	13.0	24.6	21.8
Pencil Hardness	H	4H	H
Boiling Water Resistance			
Blister Rating	8D	10	10
Salt Fog Exposure, 350 hours			
Creep, mm	2	1	2
Blister	4D	4F	2M
Humidity Exposure, 350 hours			
60° Gloss, % Reflectance	5	59	27

Test Methods	
Blister Rank	ASTM D 714
Creep	Measurement of undercutting caused by corrosion
Gloss	ASTM D 523
Hot water soak	1 hour in boiling water, 1 hour soak with heat removed and 1 hour drying
Humidity Exposure	ASTM D 2247
Impact Flexibility	ASTM D 2794
König hardness	ASTM D 4366
MEK double rubs	2 pound hammer
Pencil Hardness	ASTM D 3363
Salt fog Exposure	ASTM D 4587
Tukon Hardness	ASTM D 1474

Supplier Reference	
1. Eastman, 75% solids, Z <sub>3</sub> -Z <sub>5</sub> viscosity, 55 acid number on solids, 64 hydroxyl number, 876 equivalent weight	2. Solutia, 100% hexamethoxymethylmelamine, X-Z2 viscosity
3. Dow Corning, 10% silicone glycol copolymer in isopropanol	4. DuPont, titanium dioxide pigment
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