CYTEC conap® PRODUCTS

PRODUCTS MEET THE REQUIREMENTS OF RoHS

Electronic & Electrical Potting, Encapsulation & Conformal Coatings

About Cytec

Cytec manufactures CONAP® polyurethane and epoxy potting compounds and polyurethane and acrylic conformal coatings for electronic and electrical applications. Cytec's global sales and technical service network supports a wide range of UL, IPC, and MILSPEC approved products, including recognition to UL 94 V-0, UL 94 5VA, and UL RTI 120°C. Products in this brochure meet the requirements of the RoHS directive. Cytec technical specialists are available to assist you with new designs, provide production support, and improve performance and line speed in existing applications. For application assistance call **800-836-3666** or **716-372-9650**, email *ConapTechnicalSupport@Cytec.com,* or contact your local Cytec office listed on the back cover.

CONATHANE®
POLYURETHANE FILLED SYSTEMS

These systems have varying degrees of work life, viscosity, and hardness for many potting and encapsulating applications such as modules, strain sensitive components, transformers, and coils. This series contains UL RTI 120°C and UL 94 V-0 recognized systems. All of these systems exhibit excellent performance when exposed to adverse environments and temperature ranges from -65°C to +130°C.

CONATHANE®
MILITARY AND HIGH RELIABILITY POLYURETHANE SYSTEMS

High reliability systems have excellent hydrolytic stability, outstanding electrical properties over a wide temperature range, excellent thermal shock resistance, low temperature elasticity, low exotherm, and minimal shrinkage. A unique characteristic of this series is acoustical similarity to sea water, which is an essential requirement for potting transducers and other sonic devices. EN-1554 and EN-1556 are qualified to MIL-M-24041-C.

CONATHANE
POLYURETHANE UNFILLED SYSTEMS

Low viscosity, low durometer polyurethane systems for potting, casting, embedding, and encapsulation of electronic circuits, components, and power devices. Low stress build-up on embedded components, excellent moisture resistance, and low shrinkage.

CONAPOXY®/CONACURE®
EPOXY FILLED SYSTEMS

These systems have varying degrees of work life, viscosity, flame retardant ratings, and thermal conductivity. Systems of note: FR-1047/ EA-87 is UL 94 5VA recognized. The FR-1800 series is new UL 94 V-O epoxy technology: FR-1810 is 1:1 mix ratio and exhibits high elongation, FR-1820 is fast gelling with low exotherm, and FR-1830 is low viscosity (2,200 cps) for optimum processing.

CONAPOXY
EPOXY UNFILLED SYSTEMS

These systems possess low shrinkage, low exotherm, good thermal shock and electrical properties, with a hardness range of 75-90 Shore D. These low viscosity systems are used for potting and encapsulating resistors, connectors, solenoids, transformers, and other electrical devices.

CONAP
CONFORMAL COATINGS

Polyurethane (Type UR) and Acrylic (Type AR) coatings for aerospace, automotive, consumer, industrial and marine applications. Solvent, water based, and 100% solids systems available. Cytec products are qualified to MIL-I-46058-C and IPC-CC 830 standards and recognized to UL 94 V-O.

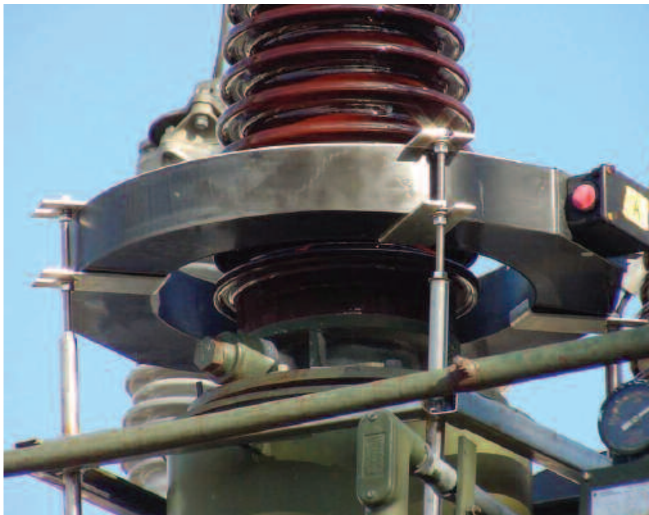
CONATHANE
POLYURETHANE FILLED SYSTEMS
PROPERTY COMPARISON CHART

	CONATHANE® EN-2521	CONATHANE EN-2523	CONATHANE EN-2534	CONATHANE EN-2550	CONATHANE EN-2551	CONATHANE EN-2552	CONATHANE EN-2553
UL Recognition	UL 94 HB, RTI 120°C	UL 94 HB, RTI 120°C	UL 94 HB, RTI 120°C	UL 94 V-O, RTI 120°C	UL 94 V-O, RTI 120°C	UL 94 V-O, RTI 120°C	UL 94 V-O, RTI 120°C
Typical Handling Properties							
Mix Ratio by Weight, Part A/Part B	20 / 100	20 / 100	20 / 100	17 / 100	17 / 100	17 / 100	17 / 100
Mix Ratio by Volume, Part A/Part B	26 / 100	23 / 100	23 / 100	21 / 100	20 / 100	20 / 100	20 / 100
Mixed Viscosity @ 25°C, cps	4,000	2,800	2,200	3,000	4,500	4,500	4,500
Work life @ 25°C, (1 lb. Mass)	60-80 min.	45-50 min.	15-20 min.	35-40 min.	4-7 min.	12-15 min.	50-55 min.
Cure Schedule: @ 25°C/@ 60°C/@ 100°C	7D/6H/4H	7D/6H/4H	7D/16H @ 80°C/2H	7-10D/12-16H/4-6H	7D/16H @ 80°C/4H	7D/16H @ 80°C/4H	7D/16H @ 80°C/NA
Typical Physical Properties - Cured System							
Color	Tan or Black	Tan or Black	Black	Black	Blue	Blue	Blue
Hardness, Shore D	72/65	55/50	55/50	65	55/60	55/60	95 Shore A
Specific Gravity (Cured)	1.53	1.44	1.45	1.48	1.47	1.47	1.47
Tensile Strength, psi	1,600	1,600	1,970	3,800	1,025	1,025	1,050
Elongation, %	40	50	60	32	39	39	60
Linear Shrinkage, %	0.71	0.59	0.65	0.58	0.75	0.75	0.75
Thermal Shock, 10 cycles -65°C to +130°C	Passes	Passes	Passes	Passes	Passes	Passes	Passes
Linear Thermal Expansion, in./in./°C	16.0 x 10^{-5}	15.0 x 10^{-5}	15.0 x 10^{-5}	16.5 x 10^{-5}	11.8 x 10^{-5}	11.8 x 10^{-5}	11.8 x 10^{-5}
Thermal Conductivity cal/sec/cm^2/°C/cm	6.5 x 10^{-4}	4.5 x 10^{-4}	4.5 x 10^{-4}	8.0 x 10^{-4}	1.55 x 10^{-3}	1.55 x 10^{-3}	1.55 x 10^{-3}
% Water Absorption - 24 hours 7 days	0.19 / 0.55	0.14 / 0.45	0.15 / 0.45	0.075 / 0.187	0.06 / 0.15	0.06 / 0.15	0.06 / 0.15
Fungus Resistance MIL-STD-810B	Non-Nutrient	Non-Nutrient	Non-Nutrient	Non-Nutrient	Non-Nutrient	Non-Nutrient	Non-Nutrient
Operating Temperature Range	-55° to +130°C	-55°C to +130°C	-55°C to +130°C	-65°C to +130°C	-55°C to +130°C	-55°C to +130°C	-55°C to +130°C
Typical Electrical Properties - Cured System							
Dielectric Strength, vpm (1/16" Sample)	650	630	584	530	585	585	563
Arc Resistance - Seconds	>120	>120	>120	>120	>120	>120	>120
Dielectric Constant @ 1kHz - @ 25°C/@ 130°C	4.3 / 8.5	4.1 / 8.4	4.1 / 8.4	4.13 / 5.73	3.99 / 4.88	3.99 / 4.88	4.2 / 4.88
Dissipation Factor @ 1kHz - @25°C/@130°C	0.045 / 0.280	0.049 / 0.100	0.049 / 0.110	0.034 / 0.035	0.053 / 0.060	0.053 / 0.060	0.069 / 0.060
Volume Resistivity, ohm-cm - @ 25°C/@ 130°C	1.2 x 10^{14}/ 1.0 x 10^{10}	3.4 x 10^{13}/ 1.5 x 10^{11}	3.4 x 10^{13}/ 1.5 x 10^{11}	2.1 x 10^{14}/ 1.4 x 10^{11}	6.8 x 10^{13}/ 1.1 x 10^{12}	6.8 x 10^{13}/ 1.1 x 10^{12}	3.1 x 10^{14}/ 1.1 x 10^{12}
Surface Resistivity, ohms - @ 25°C/@130°C	4.6 x 10^{13}/ 3.0 x 10^{9}	1.5 x 10^{13}/ 8.0 x 10^{10}	1.5 x 10^{13}/ 8.5 x 10^{10}	6.1 x 10^{17}/ 7.8 x 10^{11}	2.8 x 10^{17}/ 4 x 10^{11}	3.5 x 10^{15}/ 4 x 10^{11}	3.5 x 10^{15}/ 4 x 10^{11}

	CONATHANE EN-3010	CONATHANE EN-4020
UL Recognition	UL 94 V-O	UL 94 V-O
Typical Handling Properties		
Mix Ratio by Weight, Part A/Part B	39.4 / 100	15.5 / 100
Mix Ratio by Volume, Part A/Part B	50 / 100	21 / 100
Mixed Viscosity @ 25°C, cps	2,400	2,200 (Part B at 40°C)
Work life @ 25°C, (1 lb. Mass)	15-20 min.	35-45 min. at 40°C
Cure Schedule: @ 25°C / @ 80°C	7 days / 16 hrs.	7 -10 days / 16 hrs.
Typical Physical Properties - Cured System		
Color	Tan or Black	Black
Hardness	70 Shore A	65/70 Shore D
Specific Gravity (Cured)	1.5	1.47
Tensile Strength, psi	733	2,850
Elongation, %	139	50
Linear Shrinkage, %		0.72
Thermal Shock		Passes 6 cycles, -50°C to 120°C
Linear Thermal Expansion, in./in./°C		
Thermal Conductivity cal/sec/cm^2/°C/cm		4.2 x 10^{-4}
% Water Absorption - 24 hrs / 7 days	0.74 / 1.37	0.28 / 0.66
Fungus Resistance MIL-STD-810B		Non-Nutrient
Operating Temperature Range	-55°C to +130°C	-55°C to +130°C
Typical Electrical Properties - Cured System		
Dielectric Strength, VPM (1/16" Sample)	504	510
Arc Resistance - Seconds		>182
Dielectric Constant @ 1kHz - @ 25°C	4.1	4.2
Dissipation Factor @ 1kHz - @ 25°C	0.033	0.057
Volume Resistivity, ohm-cm - @ 25°C	3.8 x 10^{11}	7.4 x 10^{14}
Surface Resistivity, ohms - @ 25°C	9.0 x 10^{12}	4.3 x 10^{15} at 130°C

OUTSTANDING FEATURES

- Low Cost
- Easy to Handle (process)
- Low Processing Hazards
- Non-MBOCA/Non-TDI
- Fungus Resistance
- Low Exotherm
- Low Shrinkage
- Improved Thermal Shock
- Low Stress on Embedded Components
- Excellent Dielectric Properties
- Room and/or Elevated Temperature Curing
- UL Recognized Systems, Systems to Meet UL 94 V-O Flame Resistance Rating



CONATHANE
MILITARY AND HIGH RELIABILITY POLYURETHANE SYSTEMS
PROPERTY COMPARISON CHART

	EN-7	EN-1554	EN-1556	EN-16
Military Specification		MIL-M-24041-C	MIL-M-24041-C	
Typical Handling Properties				
Mix Ratio by Weight, Part A/Part B	100 / 17.5	100 / 33	100 / 33	100 / 25
Mix Ratio by Volume, Part A/Part B	100 / 17	3 / 1	3 / 1	4 / 1
Mixed Viscosity, @ 25°C, cps	5,500	18,000	10,400	4,000
Work life @ 25°C, (1 lb. Mass)	35 min.	2 hrs (2lb. mass)	60-70 min.(1/2lb. mass)	30 min.
Cure Schedule: @ 25°C	7 days	3 weeks	10-14 days	7 days
@ 80°C	16 hrs.	16 hrs.	16 hrs.	16 hrs.
Typical Physical Properties - Cured System				
Color	Opaque Amber	Amber or Black	Amber or Black	Amber
Specific Gravity (Cured)	1.01	1.09	1.05	1.06
Shore A Hardness (±5)	90	85	80	80
Tensile Strength, psi	2,300	4,500	5,000	4,220
Tear Strength, pli	320	350	200	418
Elongation, %	450	550	400	512
Water Absorption, %, 24 Hours/30 Days	0.2 / 0.43	24hrs - 0.325	24hrs - 2.08 @ 200°F	0.2 / 0.31
Linear Shrinkage, %	1.15	4.50	3.64	2.60
Thermal Shock, -70°C to +130°C (10 cycles)	Passes			
Fungus Resistance	Non-Nutrient	Non-Nutrient	Non-Nutrient	Non-Nutrient
Typical Electrical Properties - Cured System				
Dielectric Strength, VPM 1/16" @ 25°C	785	125mil = 310	125mil = 350	481
Arc Resistance, seconds @ 25°C	>120	120	>120	>120
Test Temperature	25°C / 130°C	25°C	25°C	25°C
Dielectric Constant @ 100 Hz	3.00 / 3.80	6.63	6.12	6.38
@ 1 MHz	2.8 / 3.3	5.23	5.06	4.48
Dissipation Factor @ 100 Hz	0.032 / 0.032	0.044	0.026	0.026
@ 1 MHz	0.012 / 0.045	0.059	0.060	0.083
Volume Resistivity, ohm-cm	4.3 x 10^{15} / 7.4 x 10^{11}	5.1 x 10^{12}	2.4 x 10^{12}	
Insulation Resistance, ohms	>2.5 x 10^{13} / 2.3 x 10^{10}	5.8 x 10^{13} 2.4 x 10^{11} (250°F)	9.0 x 10^{13} 4.2 x 10^{11}(250°F)	1.5 x 10^{11}

CONATHANE
POLYURETHANE UNFILLED SYSTEMS

	EN-14	EN-21	EN-22400
UL Recognition	RTI 120°C UL 94 V-2	RTI 120°C UL 94 HB	
Typical Handling Properties			
Mix Ratio by Weight, Part A/Part B	100 / 90	100 / 116	100 / 80
Mix Ratio by Volume, Part A/Part B	1 / 1	100 / 137	100 / 94
Mixed Viscosity, @ 25°C, cps	1,500	2,000	3,000
Work life @ 25°C, (1 lb. Mass)	15 min.	40 min.	25 min.
Cure Schedule: @ 25°C	7-10 days	7 days	7 days
@ 80°C	16 hrs.	16 hrs.	16 hrs.
Typical Physical Properties - Cured System			
Color	Opaque Amber or Black	Clear Amber	Clear Amber
Specific Gravity	1.04	1.07	1.07
Shore A Hardness (±5)	65	80	55
Tensile Strength, psi	600	2,000	545
Tear Strength, pli	35	119	19
Elongation, %	140	155	84
Water Absorption, %, 24 Hrs/30 Days	24hrs - 0.40	0.07 / 0.16	0.49 / 0.74
Linear Shrinkage, %	1.15	1.4	
Thermal Shock, -70°C to +130°C (10 cycles)	Passes	Passes (-65 to 130°C)	Passes (-65 to 130°C)
Fungus Resistance	Non-Nutrient	Non-Nutrient	Non-Nutrient
Typical Electrical Properties - Cured System			
Dielectric Strength, VPM 1/16" @ 25°C	584	650	500
Dielectric Constant @ 100 Hz - @ 25°C	5.71	3.4 at @ 25°C	6.8 at @ 25°C
@ 1 MHz - @ 25°C	3.42		3.3 at @ 25°C
Dissipation Factor @ 100 Hz - @ 25°C	0.123	0.017 @ 1Khz @ 25°C	0.133 @ 1Khz @ 25°C
@ 1 MHz - @ 25°C	0.038		
Volume Resistivity, ohm-cm - @ 25°C / @ 130° C	3 x 10^{13} @ 25°C	7.2 x 10^{14} / 1.8 x 10^{11}	4.1 x 10^{11} @25°C
Insulation Resistance, ohms - @ 25°C		>2.5 x 10^{13}	>2.5 x 10^{13}

CONAPOXY
EPOXY FILLED SYSTEMS

	CONAPOXY FR-1047 with			CONAPOXY FR-1810 Black	CONAPOXY FR-1820 Black	CONAPOXY FR 1830 Black
Description	Flame retardant, non-abrasive epoxy systems. Exhibit excellent resistance to thermal shock, low exotherm, and good electrical properties typified by very good arc resistance.			High Elongation (22%), low exotherm, flame retardant system with long pot life and convenient mix ratio.	Fast curing, flame retardant-system. Non-abrasive filler.	Low viscosity, ambient cure, flame retardant system. Non-abrasive filler. Not available in Europe.
CONACURE	EA-02	EA-028	EA-87	Part A / Part B	Part A / Part B	Part A / Part B
UL Recognition	UL 94 V-O		UL 94 V-O & UL 94 5VA	UL 94 V-O	UL 94 V-O	UL 94 V-O
Typical Handling Properties						
Mix Ratio by Weight, Resin/Hardener	100 / 4.5	100 / 11	100 / 13	1 / 1	100 / 25	100 / 20
Mix Ratio by Volume, Resin/Hardener	100 / 9	100 / 23	100 / 32	1 / 1	2.5 / 1	3 / 1
Mixed Viscosity @ 25°C, cps	20,000	3,600	3,200	8,000	6,900	2,190
Pot Life - 100 Grams @ 25°C	55 min.	80 min.	75 min.	80 min.	15-18 min.	50 min.
Cure Time & Temperature	24 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C	32-48 hrs. @ 25°C 3-4 hrs. @ 60°C	24-36 hrs. @ 25°C	24-36 hrs. @ 25°C 3-4 hrs. @ 60°C
Typical Physical Properties - Cured System						
Operating Temperature	130°C	130°C	130°C	105°C	130°C	130°C
Hardness, Shore D	88	85	88	80-85	80-85	80-85
Linear Shrinkage, %	0.70	1.20	1.10	0.06	0.21	0.07
Water Absorption, %, 7 Days @ 25°C	0.17	0.16	0.40			
Tensile Strength, PSI	7,000	6,600	7,600	1,325	4,880	5,200
Typical Electrical Properties - Cured System						
Dielectric Constant @ 1KHz , @ 25°C / 105°C	6.30 / 6.80	6.00 / 6.20	5.10 / 7.40	4.39 @ 25°C	4.18 @ 25°C	4.14 @ 25°C
Dissipation Factor @ 1KHz - @ 25°C / 105°C	0.059 / 0.130	0.067 / 0.145	0.051 / 0.125	0.037 @ 25°C	0.024 @ 25°C	0.017 @ 25°C
Volume Resistivity, ohm-cm @ 25°C	2.0 x 10^{15}	3.0 x 10^{14}	1.0 x 10^{15}	7.1 x 10^{13}	4.6 x 10^{14}	6.9 x 10^{14}
@ 105°C	3.5 x 10^{11}	4.0 x 10^{13}	1.5 x 10^{11}			
Surface Resistivity, ohms - @ 25°C	5.0 x 10^{15}	9.0 x 10^{14}	3.0 x 10^{15}	4.7 x 10^{15}	2.2 x 10^{15}	2.0 x 10^{15}
@ 105°C	6.2 x 10^{12}	8.0 x 10^{13}	4.8 x 10^{12}			
Dielectric Strength, VPM	400	400	400	528	493	510

	CONAPOXY FR-1272	CONAPOXY FR-1274	CONAPOXY FR-1210		
Description	Low cost, low viscosity, low exotherm potting and casting system.	Low cost, low viscosity, low exotherm potting and casting - convenient mix ratio.	Filled version of RN-1200 with lower shrinkage, improved thermal properties.		
CONACURE	Part A / Part B	Part A / Part B	EA-02	EA-028	EA-87
UL Recognition	UL 94 V-O	UL 94 V-O			
Typical Handling Properties					
Mix Ratio by Weight, Resin/Hardener	100 / 7	1 / 1	100 / 5.5	100 / 14	100 / 18
Mix Ratio by Volume, Resin/Hardener	100 / 15	1 / 1	100 / 9.3	100 / 23	100 / 31
Mixed Viscosity @ 25°C, cps	10,000	40,000	10,000	9,000	4,500
Pot Life - 100 Grams @ 25°C	150 min.	190 min.	30 min.	40 min.	60 min.
Cure Time & Temperature	24-48 hrs. @ 25°C	24-48 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C
	3-5 hrs. @ 60°C	3-5 hrs. @ 60°C	2 hrs.@ 60°C	2 hrs.@ 60°C	2 hrs @ 60°C
Typical Physical Properties - Cured System					
Operating Temperature	130°C	130°C	130°C	130°C	130°C
Hardness, Shore D	88	80	85	80	90
Linear Shrinkage, %	0.0001	0.0010	0.60	0.90	0.40
Water Absorption, %, 7 days @ 25°C			0.20	0.12	0.40
Tensile Strength, PSI	1,900	5,500	8,000	6,500	8,050
Typical Electrical Properties - Cured System					
Dielectric Constant @ 1KHz , @ 25°C / 105°C	4.80 @ 25°C	4.25 @ 25°C	4.30 / 4.70	4.90 / 5.60	4.20 / 5.00
Dissipation Factor @ 1KHz - @ 25°C / 105°C	0.014 @ 25°C	0.022 @ 25°C	0.003 / 0.05	0.007 / 0.09	0.035 / 0.12
Volume Resistivity, ohm-cm @ 25°C / 105°C	6 x 10^{14} @ 25°C	8 x 10^{14} @ 25°C	3.0 x 10^{14}	3.0 x 10^{13}	4.2 x 10^{15}
			2.0 x 10^{10}	3.0 x 10^{10}	3.0 x 10^{11}
Surface Resistivity, ohms - @ 25°C	5 x 10^{15}	3 x 10^{17}	9.2 x 10^{15}	2.5 x 10^{15}	6.8 x 10^{15}
@ 105°C			6.8 x 10^{12}	5.0 x 10^{12}	7.5 x 10^{12}
Dielectric Strength, VPM	420	400	375	375	375

CONAPOXY®
EPOXY UNFILLED SYSTEMS

Description	Unfilled, low viscosity casting systems recommended for potting and encapsulating resistors, connectors, solenoids, transformers, coils, and other electrical devices			Undiluted, low viscosity potting and encapsulating systems with excellent impact and thermal shock resistance.			High-temperature epoxy potting and impregnation system designed to meet Class H operating equirements.
	CONAPOXY RN-1000 with			**CONAPOXY RN-1200 with**			**CONAPOXY FR-1080**
CONACURE	EA-02	EA-028	EA-87	EA-02	EA-028	EA-87	Part A / Part B
Mix Ratio by Weight, Resin/Hardener	100 / 11	100 / 28	100 / 37	100 / 11	100 / 28	100 / 37	100 / 83
Mix Ratio by Volume, Resin/Hardener	100 / 12	100 / 29	100 / 40	100 / 13	100 / 32	100 / 45	100 / 67
Mixed Viscosity @ 25°C, cps	600	500	250	3,000	1,500	1,500	2,500
Pot Life - 100 Grams @ 25°C	30 min.	30 min.	90 min.	30 min.	40 min.	60 min.	>2 hrs.
Cure Time & Temperature	24 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C	24 hrs. @ 25°C	8 hrs. @ 25°C
Typical Physical Properties - Cured System							
Operating Temperature	105°C	105°C	105°C	130°C	130°C	130°C	180°C
Hardness, Shore D	80	80	88	84	84	85	90
Linear Shrinkage, %	1.30	1.40	0.80	1.10	1.20	0.80	1.42
Water Absorption, %, 7 Days @ 25°C	0.20	0.20	0.32	0.15	0.20	0.30	
Tensile Strength, PSI	10,000	4,000	7,200	10,000	7,600	8,100	8,200
Typical Electrical Properties - Cured System							
Dielectric Constant @ 1KHz - @ 25°C / 105°C	3.50 / 3.70	4.70 / 7.50	5.00 / 7.50	3.50 / 3.70	4.70 / 5.50	4.20 / 5.00	3.12 / 3.29
Dissipation Factor @ 1KHz - @ 25°C / 105°C	0.002 / 0.020	0.015 / 0.120	0.040 / 0.150	0.017 / 0.08	0.001 / 0.08	0.035 / 0.15	0.004 / 0.004
Volume Resistivity, ohm-cm @ 25°C	3.0 x 10^{14}	4.0 x 10^{12}	9.0 x 10^{15}	2.0 x 10^{14}	4.0 x 10^{13}	4.2 x 10^{15}	9.7 x 10^{16}
@ 105°C	2.0 x 10^{11}	3.0 x 10^{11}	5.5 x 10^{11}	3.0 x 10^{11}	4.0 x 10^{10}	2.0 x 10^{11}	2.9 x 10^{14}
Surface Resistivity, ohms - @ 25°C	2.0 x 10^{15}	9.5 x 10^{14}	4.0 x 10^{16}	2.4 x 10^{15}	1.0 x 10^{15}	8.8 x 10^{15}	5.5 x 10^{16}
@ 105°C	4.5 x 10^{12}	1.0 x 10^{12}	7.5 x 10^{13}	4.0 x 10^{12}	8.5 x 10^{11}	5.2 x 10^{12}	5.7 x 10^{14}
Dielectric Strength, VPM	350	350	350	350	350	350	600

CONAP
CONFORMAL COATINGS *All coatings are MIL-I-46058-C and IPC-830 Rev B. Approved*

Property Comparison Chart

HANDLING PROPERTIES	CONATHANE CE-1164	CONAP CE-1170	CONAP CE-1171	CONATHANE CE-1175	CONATHANE CE-1155	CONATHANE CE-1155-35
UL Recognition		UL 94 V-0	UL 94 V-0	UL 94 V-0	UL 94 V-0	
Type	**Polyurethane**	**Acrylic**	**Acrylic**	**Polyurethane**	**Polyurethane**	**Polyurethane**
Viscosity @ 25° C, cps	100	400	900	<500	72*	25-35
Flashpoint, °F, (TCC)	55	55	65	>200	81A / 45B	90A / 55B
% Solids Content	50	31	30	32	50A / 65B	37A / 30B
Pot Life @ 25° C	Indefinite	Indefinite	Indefinite	Indefinite	6 hrs.	8-10 hrs.
Shelf Life @ 25° C (From date of Mfg. when stored in the original unopened containers @ 65°-85°F)	15 mos.	15 mos.	15 mos.	15 mos.	12 mos.	15 mos.
Tack Free Time @ 25°C	20-30 min.	10-15 min.	20 min.	1hr.	4-5 hrs.	2-3 hrs.
Mix Ratio, A/B	NA (one component)	NA (one component)	NA (one component)	NA (one component)	100A / 70B by weight	100A / 100B by volume
Recommended Cure Schedule @ 25°C / 60°C	7 days / 3 hrs. + 2-3 days at RT	24 hrs./45 min.	24 hrs./1hr.	3 hrs. @ 60°C + 3-5 days @ 25°C / 4 hrs @ 85°C + 1-2 days @ 25°C	7 days/3 hrs.	5-7 days/3 hrs.
Cure Mechanism	Moisture Cure	Solvent Evap.	Solvent Evap.	Water Evap.	Chemical Cure	Chemical Cure

** Initial viscosity*

CONFORMAL COATING METHODS OF APPLICATION

SPRAY COATING – This is a practical and widely used method of applying conformal coatings. Cytec Conformal Coatings, in most instances, require slight dilution for spray applications. It is recommended that the conformal coating be diluted 10% – 20% by weight using the recommended solvent.

Several factors should be noted when spray coating:

1. The spraying operation should take place under an exhaust hood so that the fumes and fine mist are pulled away from the operator.
2. If the unit to be sprayed is highly compacted and/or has a high population of attached components, it may be necessary to spray apply the coating on several different planes to ensure complete coverage under the components.
3. If adequate coverage under the components is virtually impossible, it may be necessary to dip coat the unit with a highly diluted coating (50% or more) prior to spraying. The diluted viscosity of the coating should be low enough to prevent thick filleting and/or bridging of components.

Cytec works closely with leading conformal coating equipment manufacturers. Contact Cytec technical service for assistance in selecting the optimum equipment for your application.

DIP COATING - This is an effective method of applying conformal coatings to printed circuit boards that are not too bulky or irregular in shape. Using this method requires that the unit be immersed in a dip tank containing the conformal coating and withdrawn at a slow uniform rate.

In any dip coating application, two interdependent variables must be controlled to obtain desired results:

1. **VISCOSITY** - an increase in the viscosity of the material in the dip tank will increase the thickness of the resin film deposited.

2. **WITHDRAWAL RATE** - in most applications, a slow withdrawal rate will help produce a film of uniform thickness over the entire length of the board. A fast withdrawal rate will create drainage of the conformal coating that will cause a wedge-shaped film (thin at the top and thick at the bottom).

BRUSH COATING - This method is mainly used to repair the coating film when a defective component has been removed from the board. It is generally not recommended for production use because of the relatively poor brushing qualities of conformal coatings (it is difficult to apply a uniform film thickness).

Whatever method of application is used, it is of the utmost importance that the conformal coatings be applied as uniformly as possible to eliminate thick fillets and bridging of components. For optimum performance, it is recommended that the cured coating thickness be not be less than 1.0 mil nor greater than 4.0 mils. Generally, a 2.0 mil thickness (± 0.5 mils) will give the best protection against the environmental requirements of MIL-I-46058. Two coats of a conformal coating (approximately 2 mils thick) will provide adequate coverage on solder spikes. Thin uniform coats usually allow solvent to evaporate more readily, and the chance of bubbling in the coating is minimized. Coating films that are too heavy can retain solvents that may cause bubbling and lead to poor humidity resistance and/or eventual cracking of the film or fragile components. If severe humidity or environmental conditions are expected, coating thickness greater than 2.5 mils can be utilized, but under no circumstances should the coating thickness exceed 4.0 mils.

The most important factor involved in conformal coating is the cleanliness of the laminate or substrate being coated. This will ensure prevention of under-film corrosion and promote the adhesion of the cured film to the substrate and attached components. Boards and components MUST BE CLEAN, OIL-FREE, AND DRY.

Refer to Cytec.com/conap Bulletin #C-115(C) for complete cleaning and processing instructions.

GENERAL HANDLING PROCEDURES FOR EPOXY AND POLYURETHANE SYSTEMS

1. The two components should be weighed carefully in metal, plastic, or glass containers.

2. The components should be mixed thoroughly using metal, plastic, or glass stirrers. NOTE: Avoid paper cups and wooden stirrers!

3. For cosmetically clean and bubble-free castings, the mixed system should be degassed at 1 to 5mm Hg vacuum. Containers should be large enough to allow for frothing during degassing.

4. Mixed materials should be carefully poured into electrical/electronic units, devices, or molds to avoid any bubble or void entrapment. The material should then be cured at room temperature or elevated temperature as required.

5. Automatic mixing and dispensing equipment can be utilized with these systems for larger volume production. Consult your local Cytec Sales Representative or one of our Technical Service Specialist for recommendations.

STORAGE

All Systems should be stored at temperatures of 65°F to 85°F in tightly closed containers. If containers are opened and the contents only partially used, the container should be flushed with dry nitrogen or dry air before being resealed.

Filled components have a tendency to settle in the container during transit and/or storage. This is usually a soft settling and can be brought back into suspension by agitation or by rolling on a roller. This must be done prior to mixing to ensure proper mix ratios of the systems.

VISCOSITY GUIDE

Very Low	**Low**
1 Centipoise (cps) – Water	250 Centipoise (cps) – #30 Motor Oil
100 Centipoise (cps) – Machine Oil	1,000 Centipoise (cps) – Castor Oil
Medium	**High**
4,500 Centipoise (cps) - #40 Motor Oil	25,000 Centipoise (cps) – Choc. Syrup
	100,000 Centipoise (cps) – Molasses

TEMPERATURE CONVERSION

°F = (°C x 9/5) + 32

°C = (°F – 32) x 5/9

UNDERWRITER LABORATORIES FILE NUMBERS

Plastics – Component: QMFZ2.E69804

Coatings for Use on Recognized Printed Wiring Boards – Component: QMJU2.E93618

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