

CONATHANE® EN-9

CONATHANE EN-9 is a two-component, non-MBOCA, high-strength liquid polyurethane potting and molding system designed to ensure the performance of electrical/electronic assemblies exposed to severe environmental extremes. Elastomers prepared from CONATHANE EN-9 exhibit the following outstanding properties:

- Superior Hydrolytic Stability
- Good Handling Properties
- Thermal Shock Resistance (-70°C To 135°C)
- Non-MBOCA Curing System
- High Dielectric Strength (>700 Vpm)
- Low Dielectric Constant
- Low Viscosity
- Low Dissipation Factor
- Fungus Resistance

CONATHANE EN-9 is highly recommended for cable and connector potting and molding - both military and commercial - for water-tight electrical connectors, harness breakouts, and cables. Other applications include potting and encapsulation of modules, wire wound devices, and strain sensitive components as well as 100% solids and solvent-based coatings for printed circuitry and components.

The dielectric properties of CONATHANE EN-9 are excellent; the dielectric constant and dissipation factor are exceptionally low and remain relatively unchanged over the recommended operating temperature range of -70°C to 130°C.

CONATHANE EN-9 cures to a nominal Shore A Hardness of 85 and has an application life of about 2 hours. It is available in translucent amber or black in pre-weighed, two-component units.

TYPICAL PRODUCT CHARACTERISTICS

	EN-4 Part A	EN-9 PART B
Color	Translucent Amber	Amber or Black
Viscosity @ 25°C, cps	7500 ± 2500	950 ± 150
Specific Gravity @ 25°C	0.97 ± 0.3	1.00 ± 0.03
NCO Content, %	9.0 ± 0.2	---
Shelf Life (from date of manufacture when unopened and in the original containers)	15 months	15 months
Non-volatile Content (Mixed), %	>99	

TYPICAL CURED PROPERTIES

PHYSICAL PROPERTIES	EN-9	Test Method
Color	Translucent Amber or Black	Visual
Specific Gravity @ 25°C	1.01	ASTM DB792
Hardness, Shore A	90 ± 5	ASTM D-2240
Tensile Strength, psi	2000	ASTM D-412
100% Modulus, psi	700	
300% Modulus, psi	1300	
Ultimate Elongation, %	450	ASTM D-412
Tear Strength (Die C), pli	275	ASTM D-624
Shrinkage, %, Linear/Volume	1.15 / 3.7	CONAP/ MIL-M-24041
Moisture Absorption (24 hours @ 200°F), %	0.45	MIL-M-24041
Water Absorption @ 25°C, 24 hours	0.20	ASTM D-570
30 days	0.43	
Heat Aging, 7 days @ 135°C (275°F), % Wt. Loss	0.46	MIL-M-24041
Shore A Hardness Change	+8	
Fungus Resistance	Non-Nutrient	MIL-E-5272C
Thermal Shock, 10 cycles, Olyphant washer 130°C to -70°C	Passes	MIL-I-16923E
Compression Set, (Method B), %	44	ASTM D-395
Peel Strength, piw		MIL-M-24041
Aluminum primed w/AD-1147-C	>20	
Stainless Steel primed w/AD-1146-C	>20	
Neoprene primed w/DPPR-7156	>20	
PVC primed w/AD-1167	>20	

ELECTRICAL PROPERTIES	25°C	130°C	TEST METHOD
Dielectric Constant, 100 Hz	3.0	3.8	ASTM D-150
1 KHz	2.9	3.8	
1 MHz	2.8	3.3	
Dissipation Factor, 100 Hz	0.032	0.032	ASTM D-150
1 KHz	0.033	0.033	
1 MHz	0.012	0.045	
Volume Resistivity, ohm-cm	>4.3 x 10 ¹⁵	7.4 x 10 ¹¹	ASTM D-257
Surface Resistivity, ohms	>1.0 x 10 ¹⁵	1.6 x 10 ¹²	ASTM D-257
Insulation Resistance, ohms	>2.5 x 10 ¹³	2.3 x 10 ¹⁰	MIL-M-24041
Dielectric Strength, vpm (1/16")	750	---	ASTM D-149
Arc Resistance, seconds	120	---	MIL-M-24041
Flame Resistance, 55 amps D.C.	No Ignition	---	MIL-M-24041

HYDROLYTIC STABILITY

Elastomers prepared from CONATHANE EN-9 offer unsurpassed hydrolytic stability. The following table presents the properties of these elastomers after continuous exposure to 97°C - 95% R.H. for the periods indicated. Specimens were tested within 24 hours upon removal from chamber.

Property	Original	28 Days	56 Days	84 Days	112 Days
Hardness, Shore A	90	90	89	88	87
Tensile Strength, psi	2000	1600	1400	900	775
300% Modulus, psi	1700	1175	1100	800	700
Ultimate Elongation, %	450	420	430	390	370
Tear Strength (Die C), pli	276	280	285	197	187
Dielectric Constant @ 25°C, 1 KHz	2.9	---	---	---	3.0
Dissipation Factor @ 25°C, 1 KHz	0.033	---	---	---	0.030
Volume Resistivity @ 25°C, ohm-cm	4.3 x 10 ¹⁵	---	---	---	2.8 x 10 ¹⁵
Dielectric Strength, vpm (1/16")	750	---	---	---	566

RECOMMENDED PROCESSING PARAMETERS

Mix Ratio by Weight – EN-4 Part A/EN-9 Part B	100/17.5
Exotherm (2 lb. mass), mixed @ 25°C	55°C

	Initial	30 minutes	60 minutes	90 minutes	120 minutes
Mixed Viscosity @ 25°C, cps	6,800	13,200	52,000	160,000	250,000

	60°C	80°C	100°C
Cure Time, hours	24	16	8
Demold Time, hours	10	8	4

NOTE: CONATHANE EN-4 Part A may crystallize upon storage or during shipment. If this has occurred, heat to 60°C, mix thoroughly and cool to room temperature before processing.

Mix CONATHANE EN-4 Part A and CONATHANE EN-9 Part B together thoroughly at 25°C-60°C using metal, plastic, or

glass stirrers and containers. Degas the mixed material at 1-5mm of mercury and pour into molds at 25°C-100°C. Containers should be large enough to allow for volume expansion during the degassing cycle. Any material or container that could introduce moisture into the system should be avoided.

SPECIAL NOTICE

Due to the excellent solubility of this liquid system in solvents such as methyl ethyl ketone (MEK), xylene, toluene, and various blends of these solvents, this system also shows promise as a flexible conformal coating for printed circuitry and components. Initial laboratory evaluations have shown excellent dipping and spraying qualities when diluted 40%-60% with a 50/50 blend of MEK/toluene.

STORAGE AND HANDLING

The shelf life of CONATHANE EN-4 Part A and CONATHANE EN-9 Part B is 15 months from date of manufacture in the original, unopened containers when stored at 70°F-85°F. If containers are opened and the contents only partially used, containers should be flushed with dry nitrogen (see CONAP® Dri-Purge) before resealing to prevent waste of material.

CAUTION: Avoid contact with the resin and hardener. The use of protective clothing is recommended. Should contact occur, wash with mild soap and water. Use only in well-ventilated areas and avoid prolonged or repeated breathing of fumes. Curing ovens should be vented to the atmosphere.

COLORING

CONATHANE EN-4 Part A mixed with CONATHANE EN-9 Part B cures to a translucent amber. CONAP® color concentrates can be added to make color variations. (see CONAP® DS-1830 bulletin AC-102)

AVAILABILITY

CONATHANE EN-9 is available in two-component (CONATHANE EN-4 Part A and CONATHANE EN-9 Part B) gallon, 5-gallon, and 55-gallon units. An EVALUATION KIT of EN-9 is available at a nominal cost.

CAUTION

Responsible handling of Cytec products requires a thorough preview of safety, health, and environmental issues prior to use. Review the Material Safety Data Sheets(s) for the specific Cytec product(s) and container label information before opening containers. Ensure that employee exposure issues are understood, communicated to all workers, and controls are in place to prevent exposures above Permissible Exposure Limits (P.E.L.'s). Review safety and environmental issues to be certain controls are in place to prevent injury to employees, the community, or the environment, and ensure compliance with all applicable Federal, State, and Local laws and regulations. For assistance in this review process, please call your Cytec representative or our office noted below.

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