TECHNICAL DATA SHEET Formulated Resins

CONATHANE® EN-7 and EN-8

DESCRIPTION

CONATHANE EN-7 and EN-8 are two-component, non MBOCA based, high strength liquid polyurethane resin systems designed to ensure the performance of electrical/electronic assemblies exposed to environmental extremes. Elastomers prepared from these systems exhibit the following outstanding properties:

- Superior hydrolytic stability
- Low viscosity
- Fungus resistance
- Exceptional dielectric properties
- Thermal shock resistance
- High strength
- High elongation

These systems are recommended for use as molding and potting compounds for electrical cables, connectors, modules, wire wound devices, strain sensitive devices, as well as 100% solids coatings for printed circuitry. Their excellent adhesion to most substrates, and good flexibility, also suggest their use as staking and filleting adhesives.

Both CONATHANE EN-7 and EN-8 cure to a nominal Shore A hardness of 90. EN-7 has a working life of approximately 30 35 minutes, and cure at elevated temperatures is recommended. CONATHANE EN-8 has a working life of approximately 15 minutes and will cure at room temperature.

CHARACTERISTICS AND PROPERTIES

Table 1 | Product Description

Property	EN-4 Part A	EN-7 or EN-8 Part B
Appearance	Amber Liquid	Amber Liquid
Viscosity @ 25°C, cps	9,000	1,000
Specific Gravity @ 25°C	0.97	1.00
NCO Content, %	8.9 - 9.1	---
Shelf Life, from date of manufacture	15 months	15 months
Volatile Organic Compounds (Mixed), %	<1	---

CONATHANE EN-7 test specimens were cured 16 hours at 80°C and conditioned at 25°C for 3 days prior to testing. CONATHANE EN-8 test specimens were cured 7 days at 25°C. When processed as recommended, EN-7 and EN-8 have very similar properties.

Table 2 | Typical Cured Properties

Property	Value
Color	Amber or Black
Specific Gravity @ 25°C	1.01
Hardness, Shore A	90
Tensile Strength, psi	>2000
100% Modulus, psi	800
300% Modulus, psi	1200
Ultimate Elongation, %	>400
Tear Strength, (Die C), pli	>200
Linear Shrinkage, %	1.15 / 3.7
Water Absorption, %, 24 hours @ 25°C 30 days @ 25°C	 0.20 0.43
Heat Aging, % Wt. Gain, After 7 days @ 135°C Shore A Hardness Change	 0.41 +5
Fungus Resistance Non-Nutrient	Non-Nutrient
Thermal Shock, 10 cycles, Olyphant washer 130°C to - 70°C	 Passes
Compression Set, %, 22 hours @ 70°C	31
Peel Strength, piw Aluminum primed with AD-1146-C Stainless Steel primed with AD-1146-C Neoprene primed with DPPR-7156 PVC primed with CONAP® AD-1161	 >20 >20 >20 >20

Table 3 |Electrical Properties

Property	25°C	105°C	130°C	Test Method
Dielectric Constant, @ 100 Hz @ 1 KHz @ 1 MHz	 3.0 2.9 2.8	 4.0 3.8 3.1	 3.8 3.8 3.8	 ASTM D-150
Dissipation Factor @ 100 Hz @ 1 KHz @ 1 MHz	 0.032 0.033 0.026	 0.030 0.022 0.045	 0.032 0.033	 ASTM D-150
Volume Resistivity, ohm-cm	>$4.3x10^{15}$	$4.1x10^{12}$	$7.4x10^{11}$	ASTM D-257
Surface Resistivity, ohms	>$1.0x10^{15}$	$4.2x10^{12}$	$1.6x10^{12}$	ASTM D-257
Insulation Resistance, ohms	>$2.5x10^{13}$	$2.3x10^{11}$	$2.3x10^{10}$	MIL-M-24041
Dielectric Strength, vpm (1/16”)	785	-	-	MIL-M-24041
Arc Resistance, sec	>120	-	-	ASTM D-495

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

Table 4 |Hydrolytic Stability

Property	Original	28 Days	56 Days	84 Days	112 Days
Hardness, Shore A	94	94	94	88	87
Tensile Strength, psi	2250	1600	1400	900	775
300% Modulus, psi	1750	1175	1100	800	700
Ultimate Elongation, %	400	420	430	390	370
Tear Strength (Die C), pli	322	281	285	197	187
Dielectric Constant @ 25°C, 1KHz	2.9	-	-	-	3.0
Dissipation Factor @ 25°C, 1KHz	0.033	-	-	-	0.030
Volume Resistivity @ 25°C, ohm-cm	$>4.2x10^{15}$	-	-	-	$2.8x10^{15}$
Dielectric Strength, vpm (1/16")	785	-	-	-	566

Table 5 |Recommended Processing Parameters

Property	EN-4 Part A / EN-7 Part B	EN-4 Part A / EN-8 Part B
Mix Ratio, by Weight, EN-4 Part A / EN-7 Part B or EN-8 Part B	100/17.5	100/17.5
Mixed Viscosity @ 25°C, cps Initial 10 Minutes 20 Minutes 30 Minutes	 5,550 6,500 23,000 -GEL -	 5,550 17,000 -GEL -
Exotherm (2 lb. Mass), Mixed @	55°C	55°C
Cure Time @ 25°C @ 60°C @ 80°C @ 100°C	10-14 Days 16 hours 8-10 hours 4-6 hours	5-7 Days 4 hours 2 hours 1 hour
Demold time @ 25°C @ 60°C	8 hours 3 hours	2 hours 1 hour

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

Mix the CONATHANE EN-4 Part A component thoroughly with either the CONATHANE EN-7 Part B or the EN-8 Part B at 25°C - 40°C using metal, plastic, or glass stirrers and containers. Degas the mixed material at 1-5 mm 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.

HANDLING AND STORAGE INSTRUCTIONS

The shelf life of CONATHANE EN-4 Part A, EN-7 Part B, and EN-8 Part B is 15 months from date of manufacture when stored in the original unopened containers at temperatures of 21°C -29°C. 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.

AVAILABILITY

CONATHANE EN-14 or EN-14 Black are available in quart, gallon, 5-gallon, and 55-gallon units. An evaluation kit is available for a nominal fee.

CAUTION

Responsible handling of Cytec Industries Inc. products requires a thorough review of safety, health, and environmental issues prior to use. Review the Material Safety Data Sheets(s) for the specific Cytec Industries Inc. 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 (PELs). 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 Industries Inc. representative or our office noted below.

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