

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 | 0.20 |
| 30 days @ 25°C | 0.43 |
| Heat Aging, % Wt. Gain, After 7 days @ 135°C | 0.41 |
| Shore A Hardness Change | +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 | >20 |
| Stainless Steel primed with AD-1146-C | >20 |
| Neoprene primed with DPPR-7156 | >20 |
| PVC primed with CONAP® AD-1161 | >20 |

Table 3 | Electrical Properties

| Property | 25°C | 105°C | 130°C | Test Method |
|----------------------------------|-----------------------|----------------------|----------------------|-------------|
| Dielectric Constant, @ 100 Hz | 3.0 | 4.0 | 3.8 | ASTM D-150 |
| @ 1 KHz | 2.9 | 3.8 | 3.8 | |
| @ 1 MHz | 2.8 | 3.1 | 3.8 | |
| Dissipation Factor @ 100 Hz | 0.032 | 0.030 | 0.032 | ASTM D-150 |
| @ 1 KHz | 0.033 | 0.022 | 0.033 | |
| @ 1 MHz | 0.026 | 0.045 | | |
| 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 | 5,550 | 5,550 |
| 10 Minutes | 6,500 | 17,000 |
| 20 Minutes | 23,000 | -GEL - |
| 30 Minutes | -GEL - | |
| Exotherm (2 lb. Mass), Mixed @ | 55°C | 55°C |
| Cure Time @ 25°C | 10-14 Days | 5-7 Days |
| @ 60°C | 16 hours | 4 hours |
| @ 80°C | 8-10 hours | 2 hours |
| @ 100°C | 4-6 hours | 1 hour |
| Demold time @ 25°C | 8 hours | 2 hours |
| @ 60°C | 3 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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