



PROTAVIC ECN-809

THERMALLY CONDUCTIVE CASTING COMPOUND

PROTAVIC ECN-809 is a casting resin with excellent high temperature properties. Its high thermal conductivity, extremely low thermal expansion coefficient, low shrinkage during cure, good adhesion to a variety of substrates and remarkably good overall properties are an invaluable combination where electrical insulation and excellent mechanical properties are necessary.

PROTAVIC ECN-809 is supplied as a viscous pourable resin. It can be thinned by slight warming to prepare a flowable heat sink for encapsulation of electrical and electronic components. After cure, the rigid opaque black plastic with high dielectric strength and excellent electrical grade insulation properties affords protection for transformers, power supplies, bushings, insulators, thermostats, instruction alarms and other devices where heat transfer, outstanding thermal shock and mechanical impact resistance are considerations. Castings and embedments have been subjected to temperatures from -75° to 205°C. Because of its characteristic hardness, exact shapes cannot be machined. These are obtained by grinding or by casting to size. Its solvent and chemical resistance is excellent.

CURING AGENT FEATURES

	<u>PROTAVIC HARDENER</u>		
	<u>43</u>	<u>10</u>	<u>16E</u>
Type of Cure	Room	Room	Oven
Pot Life (mass, lb)	60 minutes (1)	45 minutes (1)	4 hours
System Viscosity	Lowest	Highest	Intermediate
System Handling	Best	Good	Excellent
Bubble Release	Generally Easy	Deaeration advised	Deaeration advised
Shock	Best	Good	Excellent
Continuous operation, °C	Low	Intermediate	High
Distortion temp, °C	Low	Intermediate	High
Adhesion to 121°C	Best	Excellent	Excellent
over 121°C	Softens	Excellent	Best

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FORM 1105 REV. 0

CURING INFORMATION

Mix entire contents of shipping container to a uniform consistency each time before dispensing. Mechanical mixing is preferable. Parts ratios below are given by weight. For applications involving molds, prepare them with **METAPART 7523** (silicone based wipe on) mold release to prevent adhesion. Remove air entrapped by mixing, using vacuum deaeration. Castings with the smallest dimension 2 inches or more should be gelled at room or slightly elevated temperature before oven curing.

Hardener 43

Warm ECN-809 to 38°C before hardener addition to aid pouring and hasten bubble release. Measure 7 parts of HARDENER 43 for each 100 parts of resin. Blend till uniform. The pot life is short. Pour without delays. The low viscosity may avoid vacuum deaeration. Cure 16 hr at 25°C or 2 hr at 65°C

Hardener 10

Warm ECN-809 to 38°C before hardener addition improves pourability and bubble release. Measure 3 to 4 parts of HARDENER 10 for each 100 parts of resin. Blend till uniform. Pour. Vacuum deaerate. Demolding may be done when casting is hard (4 hr). Cure 16 hr at 25°C or 2 hr at 65°C (a complete cure is usual after 24 hr at 25°C).

Hardener 16E

Warm ECN-809 to 70°C before hardener addition to lower viscosity and aid pourability. Measure 4 to 5 parts of HARDENER 16E for each 100 parts of resin. Blend till uniform. Pour. Deaerate in vacuum to remove entrapped air. Cure 16 hr at 75°C or 2 hr at 100°C. For optimum high temperature performance, postcure 3 hr at 150°C.

TYPICAL PROPERTIES*

A. UNCURED

<u>Product</u>	<u>PROTAVIC</u>	<u>PROTAVIC HARDENER</u>		
	<u>ECN-809</u>	<u>43</u>	<u>10</u>	<u>16E</u>
Color	Black	Colorless	Amber	Brownish red
Form	Coarse* particle dispersion	Clear liquid	Clear liquid	Watery liquid**
Specific Gravity (25°/25°C)	2.3	1.0	1.0	1.1
Viscosity (25°C), cP	200,000	15	30	15***
Flash Point, °F	164	260	280	200

*A fine particle dispersion is available as **PROTAVIC CN-773**.

**May crystallize if chilled. Crystals can be melted by mild heat: 60 minutes at 65 °C.

***Measured at 50°C.

B. CURED

<u>Composition by Weight</u>	<u>Formulation</u>		
	<u>A</u>	<u>B</u>	<u>C</u>
PROTAVIC ECN-809	100	100	100
PROTAVIC HARDENER 43	7	--	--
PROTAVIC HARDENER 10	--	3.5	--
PROTAVIC HARDENER 16E	--	--	4.5

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DB ECN-809

HANDLING

Viscosity (25°C), cP	10,000	100,000	80,000
Gel Time (25°C), hr	1.5	1.5	6

*These typical properties should not be used as a basis for preparing specifications.

<u>Cure Schedule</u>	<u>Formulation</u>		
	<u>A</u>	<u>B</u>	<u>C</u>
Time (Temperature), hr (°C)	16 (25)	4 (25)	16 (75)
Post Cure	3 (120)	20 (25)	3 (150)

Cured State

Mechanical

Form	Flexible	Hard	Rigid
Linear Shrinkage	0.008	0.007	0.001
Specific Gravity	2.3	2.3	2.3
Hardness (Shore D)	90	94	95
Tensile Strength, psi	9,000	7,600	8,450
Tensile Modulus, 10 ⁶ psi	0.4	0.4	--
Compressive Strength, psi	--	13,000	14,250
Compressive Modulus, 10 ⁶ psi	--	0.3	1.1
Flexural Strength, psi	12,800	17,000	13,300
Flexural Modulus, 10 ⁶ psi	0.4	0.4	2
Izod Impact, ft ² lb/in ⁻¹ notch	1.5	0.65	0.4
Machinable	no	no	no

Thermal

Service Temperature, °C	-75 to 130	-50 to 140	-55 to 205
Deflection Temperature (264 psi), °C	70	100	175
Thermal Conductivity, Btu'in/hrft ² °F	8.32	8.5	8.4
W/(M°K)	1.202	1.23	1.21
Glass Transition Temp (T _g), °C	52	85	129
Expansion Coefficient, 10 ⁶ °C ⁻¹	39	35	33
Stability (1000 hr, 175°C), %	--	--	-0.38
(500 hr, 160°C),	--	-0.5	--

Electrical

Dielectric Constant, 25°C 60 Hz	5.0	4.0	6.5
1 k Hz	4.9	3.9	6.3
1 M Hz	3.9	3.4	5.9
Dissipation Factor, 25°C 60 Hz	0.004	0.007	0.02
1 k Hz	0.001	0.02	0.01
1 M Hz	0.05	0.03	0.02
Volume Resistivity (25°C), ohm'cm	7 x 10 ¹⁴	6 x 10 ¹⁵	5 x 10 ¹⁶
Dielectric Strength, v'mil ⁻¹	460	430	460

STORAGE

A. Two-component kit packaging.

PROTAVIC HARDENER 43, 10 and 16E are amines. They are hygroscopic, absorbing moisture which increases viscosity and reactivity. They are also basic, absorbing carbon dioxide which destroys the reactive amine groups. Store inside in a cool, dry, well ventilated area.

PROTAVIC ECN-809 is an epoxy resin. The product is a uniform liquid when packaged, but frequently crystallizes at room temperature because the pure diglycidyl ether of bisphenol-A has a melting point of 42°C

Crystallization is induced by cold temperatures or seeding by ordinary dust particles. The product is restored to the liquid state by application of low heat (50°C to 60°C) and stirring. Flash point 164°F.

Store all products inside and in a cool, dry well ventilated area. When kept tightly closed in the original containers at temperatures from 50° to 90°F, the warranted shelf-life is 6 months.

B. Premixed, frozen packaging.

Syringes are sealed, boxed and packed with a 2-day supply of dry ice in an insulated overpack. Buyers should instruct receiving personnel not to open these overpacks unless they can be immediately placed in storage at or below -40°F. When stored properly, the warranted shelf-life is 3 months.

HANDLING PRECAUTIONS

Consult Material Safety Data Sheet before handling. Keep containers closed when not in use. Check uniformity of contents before using. These products are chemicals. Observe good industrial hygiene practices. Avoid breathing vapors. Irritation may result from repeated skin contact. Prevent eye contact. Effective ventilation, goggles and protective clothing are recommended for personnel. In case of accidental skin contact, wash the affected area with soap and water. In case of eye contact, flush eyes thoroughly with water and consult a physician. Contaminated clothing should be promptly removed and not worn until thoroughly cleaned. Discard contaminated leather. Wash thoroughly after handling and before eating, drinking, smoking or using the toilet.

PROTAVIC HARDENER 43, 10 and 16E are liquids with a mildly ammoniacal odor and corrosive properties somewhat like ammonia. Contact with skin, eyes and mucosae causes burns. Avoid contact and breathing of vapors which might cause sensitization.

PROTAVIC ECN-809 BASE is a combustible liquid (flash point 164°F) having a mild odor. Contact with skin, eyes and mucosae causes irritation and may cause sensitization and dermatitis. Avoid contact. Do not inhale. Avoid heat, sparks or flame.

All products are for industrial use only.

AVAILABILITY AND ORDER INFORMATION

A. PACKAGING

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These PROTAVIC products are available as two-component kits consisting of separate containers of epoxy resin and curing agent. Standard packaging is in half-pint, pint, quart, gallon, five gallon and 55 gallon containers. Other kit sizes are available on special order.

In addition, kits are available in a premixed form which is degassed and frozen (-40°C) at the factory. This form requires frozen storage and prompt action at receiving platforms to insure that package contents do not thaw. The standard packaging is in 3, 5, 10, 30 and 55 cc syringes.

B. COLOR

PROTAVIC ECN-809 is prepared unpigmented (shaded white), black and blue. A range of other colors are available on special order to suit your requirements.

C. ORDERING

Specify the name, number, color, quantity, container size and packaging form. Orders may be placed with your PROTAVIC area factory representative. Minimum order size is one hundred dollars. Evaluation kits are available on request.

AUXILIARIES

When a finer grained product is required, use **PROTAVIC CN-773**.

Clean uncured PROTAVIC resins from utensils and equipment with formulated **METATERGE 1405** (not flammable or corrosive; water soluble).

Soften cured PROTAVIC resins to salvage valuable components with **METASTRIP 701** (liquid or gel). It is an effective, non-corrosive solvent.

For mold release, use our **METAPART 7523** (silicone) or **7582** (fluorocarbon).

For air release, use **PROTAVIC XLN-760** (non-silicone).

RELATED PROTAVIC LITERATURE

Resin Selector Guide

Product Information Bulletins

PROTAVIC CN-773. High heat transfer epoxy. **METATERGE 1405**. Uncured epoxy remover

META-STRIP 701. Cured-plastic stripper.

METAPART 7523. Silicone mold release.

METAPART 7582. Fluorocarbon mold release.

PROTAVIC XLN-760. Air release

PROTAVIC offers a broad line of silicones and epoxies for coating, encapsulating, potting, sealing and adhering. Call to request information on your needs and help with your problems.

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