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COMPARATIVE PARAMETERS OF 13 BASIC LIQUID EPOXY SYSTEMS FOR ELECTRIC AND ELECTRONIC APPLICATIONS

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The following products can be considered classic workhorses in the electric and electronic industries, as such or in many variations to modify such factors as viscosity, reaction rate, color, heat conductivity, machinability, impact resistance, thermocycling, specific gravity and others to fit most requirements. Formulating and manufacturing these kinds of products and their variations has been Abatron's specialty since 1959.

	8109-1	8109-2	8109-3	8109-4	8109-5	8109-6	8109-7
(A) Resin ABOCAST	8109-1	8109-2	8109-3	8109-4	8109-5	8109-6	8109-7
(B) Hardener ABOCURE	8109-1	8109-2	8109-3	8109-4	8109-5	8109-6	8109-7
Parts by weight of (A)/(B) blend	100/30	100/10	100/10	100/10	100/20	100/90	100/80
(A)'s vapor pressure	<1 mm Hg @ 180° C		-----1 mm Hg @ 100° C-----		-----1 mm Hg @ 180° C		-----
(B)'s vapor pressure mm Hg/° C	<0.01/20° C 1/100° C 2.8/120° C 10/135° C	<0.01/20° C 1/100° C 2.8/120° C 10/135° C	<0.01/20° C	<0.01/20° C	<0.2/50° C 1.5/100° C 22/165° C 50/180° C	<0.2/50° C 1.5/100° C 22/165° C 50/180° C	<0.01/20° C 0.7/80° C 2.0/100° C 16/160° C
Mixing temperature: ° C	130-140° C	130-140° C	room temp.	room temp.	room temp.	room temp.	50-80° C
Viscosity of (A)/(B) blend: Poises/° C	2-6/120° C	50-500/120° C	16-20/21° C	20-26/21° C	15-25/25° C .8-15/70° C 2-3/120° C	10-25/25° C	10-20/21° C 2-4/40° C 5-1.5/60° C
Pot life: m (minutes) h (hours) or d (days) /° C	1.5h/120° C	1.5h/120° C	2.5h/20° C 30m/40° C 15m/60° C	2.5h/20° C 30m/40° C 15m/60° C	7-10/20° C 5-7h/60° C	15-20d/20° C 7-10h/120° C	6-7d/20° C 12-24h/40° C .75-7h/60° C
Typical cure cycles (time/° C: duration depends on temperature chosen)	16h/120° C 10h/140° C 8h/160° C 2h/200° C	16h/120° C 10h/140° C 8h/160° C 2h/200° C	24h/20° C 2-3h/60° C 15m/100° C	24h/20° C 2-3h/60° C 15m/100° C	4h/100° C + 3h/190° C	3h/100° C + 3h/190° C	1h/100° C + 4h/150° C
Main applications	Heavy-duty casting & potting in electric and other industry		Laminating, small components potting		Casting & laminates for high-temperature applications		Potting Impregnating laminating
Specific gravity	1.23	1.75	1.18	1.17	1.22	1.22	1.23
Tensile strength: psi	12000	9000	9500	9000	10000	11000	11000
Flexural strength: psi	20000	19000	14000	13000	20000	19000	20000
Modulus of elasticity	400000	12000000	500000	450000	500000	450000	400000
Compressive strength: psi	17000	28000	15000	12000	20000	20000	18000
Deflection temperature, ° C	110°	115°	55°	55°	180°	150°	130°
Linear coefficient of expansion: x 10 ⁻⁶ /° C	60-65	30-35	90-95	95-100	55-65	55-65	55-65
Thermal conductivity							
Cal/cm s ° C x 10 ⁻⁴	4.0-4.8	14-16	3.5-4.0	-	-	-	-
W/in ° C x 10 ⁻³	4.2-5.1	15-17	3.7-4.2	-	-	-	-
H ₂ O absorption (60x10x4 mm bar), weight increase:							
10 days @ 20° C	0.25-.035%	0.25-0.3%	0.3-.05%	0.6-0.7%	0.4-0.5%	0.2-0.3%	0.25-0.3%
1 hour @ 100° C	0.3-45%	0.3-0.35%	0.7-1.0%	1.0-1.1%	0.2-0.25%	0.15-0.2%	0.25-0.3%
Dielectric strength, short time value, 1/8" section							
Volt/0.001 inch	375-450	450-525	400-500		350-450	350-450	350-400
Dielectric constant							
50 Hz @20° C	3.6-3.9	3.7-4.0	3.9-4.1	4.0-4.1	3.7-3.9	3.6-3.8	3.4-3.7
10 ³ Hz @ 20° C	3.5-3.7	3.9-4.2	3.8-4.0	-	3.6-3.8	3.4-3.6	3.2-3.5
10 ⁶ Hz @20° C	3.5-3.7	4.0-4.2	3.6-3.8	3.6-3.9	3.3-3.5	3.3-3.5	3.0-3.3
Power factor							
50 Hz @20° C	0.003-.007	0.009-0.014	0.01-0.02	0.01-0.02	0.003-0.005	0.002-0.004	0.005-0.01
10 ³ Hz @ 20° C	0.005-0.01	0.009-0.015	0.01-0.02	-	0.005-0.007	0.003-0.005	0.005-0.01
10 ⁶ Hz @20° C	0.025-0.035	0.015-0.025	0.02-0.03	0.015-0.025	0.015-0.025	0.01-0.015	0.015-0.02
Volume resistivity							
Ohm-cm x 10 ¹⁵	>15	>15	>15	>15	>15	>15	>15

ABOCAST/ABOCURE 8109-1 AND 8109-2: In spite of their higher melting point (which, however, insures moisture elimination), these compounds are old favorites because of their remarkable combination of mechanical, chemical and electrical properties in numerous industrial application in electrical, structural and other fields.

The 8109-2 system is a filled version of the 8109-1. The other compounds of this series can be filled in the same manner, with resulting changes that can be extrapolated from the differences between 8109-1 and 8109-2.

ABOCAST 8109-3/ABOCURE 8109-3 offers low viscosity, room temperature curing and very easy processing.

ABOCAST8109-4/ABOCURE 8109-4 is a "safety hardener" (minimum toxicity) version of the 8109-3 system.

ABOCAST/ABOCURE 8109-5 AND 8109-6 offers the higher resistance in this series

ABOCAST 8109-7/ABOCURE 8109-7 is preferred for a good balance of properties and ease of use.

(A) Resin	ABOCAST	8109-8	8109-9	8109-10	8109-11	8109-12	8109-13
(B) Hardener	ABOCURE	8109-8	8109-9	8109-10	8109-11		8109-13
Parts by weight of (A)/(B) blend		100/12	100/25	100/130	100/28		100/23
(A)'s vapor pressure	----- 1 mm Hg @ 180° C -----						
(B)'s vapor pressure mm Hg/° C	<0.01/20° C	<0.01/20° C	1/100° C				
<0.01/20° C	1/20° C			0.04/60° C			3-4/100° C
Mixing temperature: ° C	room temp.	room temp.	room temp.	room temp.	room temp.	room temp.	room temp.
Viscosity of (A)/(B) blend:	45-60/21°	65-80/21°	35-65/21°	200-400/21°	200-400/21°	200-400/21°	100-150/21°
Poises/° C			3.5-6.5/40°	10-20/40°			10-20/40°
			0.3-0.6/60°	2-3/60°			
Pot life: m (minutes)	45m/20°	45m/20°	6-8d/20°	7-10h/20°	>4 months/20°		3-5h/20°
h (hours) or d (days) /° C	20m/40°	20m/40°	1-2h/40°	3-5h/40°	1-2 months/40°		1-3h/40°
	10m/60°	10m/60°	10-15h/60°	1-2h/60°	1-3h/100°		.5-1h/60°
Typical cure cycles	24h/20° C	24h/20° C	8h/80°	20h/60°	3h/140°		30h/60°
(time/° C: duration depends on temperature chosen)	2-3/60° C	2-3h/60° C	6h/100°	30m/100°	1h/160°		45m/100°
	10-20m/100° C	10-20m/100° C	4h/120°	20m/140°	30m/180°		30m/140°
				10m/180°			15m/180°
				+1-3h/180°	+1-3h/180°		1-3h/180°
Main applications	Potting small components and laminating		Impregnating and potting	High-temp. performance	Impregnating and laminating		Potting and laminating
Specific gravity	1.19	1.17	1.10	1.19	1.20		1.18
Tensile strength: PSI	9500	9000	8000	10000	8000		10000
Flexural strength: PSI	18000	16000	12500	20000	13000		20000
Modulus of elasticity	500000	450000	300000	400000	400000		500000
Compressive strength: PSI	18000	15000	13000	18000	17000		22000
Deflection temperature, ° C	120°	110°	70°	160°	160°		150°
Linear coefficient of expansion: x 10 ⁻⁶ /° C	65-70	65-70	95-105	60-70			50-55
Thermal conductivity							
Cal/cms ° C x 10 ⁻⁴	4.5-5.0			3.0-4.0			
W/in ° C x 10 ⁻³	4.8-5.3			3.2-4.2			
H ₂ O absorption (60x10x4 mm bar), weight increase:							
10 days @ 20° C	0.3-0.4%	0.5-0.6%	0.2-0.35%	0.5-0.6%			0.4-0.5%
1 hour @ 100° C	0.6-1.0%	0.7-0.8%	0.3-0.45%	0.4-0.5%			0.3-0.4%
Dielectric strength, short time value, 1/8" section							
Volt/0.001 inch	400-5000		300-400	400-450	350-400		400-450
Dielectric constant							
50 Hz @20° C	3.85-4.05	4.5-4.8	2.7-3.2	4.1-4.5	3.9-4.3		4.2-4.5
10 ³ Hz @ 20° C	3.8-4.0		2.5-3.0	4.0-4.5	3.9-4.3		4.2-4.6
10 ⁶ Hz @20° C	3.65-3.85	3.7-4.1	2.6-3.1	3.7-4.2	3.6-4.0		3.9-4.4
Power factor							
50 Hz @20° C	0.005-0.01	0.01-0.02	0.003-0.006	0.002-0.004	0.003-0.007		0.003-0.008
10 ³ Hz @ 20° C	0.01-0.015		0.005-0.007	0.005-0.007	0.005-0.009		0.005-0.01
10 ⁶ Hz @20° C	0.025-.03	0.03-0.04	0.01-0.015	0.02-0.04	0.02-0.04		0.02-0.04
Volume resistivity							
Ohm-cm x 10 ¹⁵	>15	>15	>15	>15	>15		>15

ABOCAST 8109-8/ABOCURE 8109-8 is a basic all-purpose compound used for structural bonding, coating and casting not less than for electric applications. It offers the highest level of strength, thermal and chemical properties obtainable with room temperature curing.

ABOCAST 8109-9/ABOCURE 8109-9 is a "safety hardener" (minimum toxicity) version of the 8109-8 system.

ABOCAST 8109-10/ABOCURE 8109-10 excels in very long pot life, prolonged high-temperature vacuum and impregnation before hardening, high thermocycling resistance, flexibility and lowest dielectric constant.

ABOCAST 8109-11/ABOCURE 8109-11 is a basic all-purpose compound like the 8109-8, but for higher temperature performance and requiring oven cure. ABOCURE 8109-11 is a solid that melts at 70-80° C and remains liquid for several hours at room temperature.

ABOCAST 8109-13/ABOCURE 8109-13 is a liquid-hardener version of 8109-11

ABOCAST 8109-12 is a ONE-COMPONENT SYSTEM. It contains a very slow "latent" hardener that is activated and accelerated by high temperatures. Storage of this material is limited by its shelf life of 4-6 months at 20-25° C. Other Abatron one-component systems are available with longer shelf life and cure cycles.

Filled version of the above materials are preferred when maximum heat conductivity, minimum coefficient of thermal expansion, minimum shrinkage, increased thermocycling resistance and other properties are required. Versions with greatly reduced specific gravity are also available, as well as any custom formulation.

The above information is the result of accurate laboratory and field tests. However, no guarantee, expressed or implied, is offered, as uses and applications are beyond our control. The above measurements are typical test results rather than set specifications. Formulas and parameters may change with the state of the art.