

PRODUCT INFORMATION

PRODUCT	<i>(TYPICAL PROPERTIES)</i>		
	These should not be considered as specifications.		
	KEY TOUGH-SEAL 21 (KEY PC2021A/B) SEALANT FOR THERMAL CYCLING		
DESCRIPTION	<p>KEY Tough-Seal 21 is a tough and durable two component, fast gelling, hybrid epoxy elastomer electrical potting compound with excellent thermal cycling performance. KEY Tough-Seal has the flexibility of a urethane and the service temperature of an epoxy. It maintains this exceptional flexibility from -40°C to 150°C (-40°F to 300°F) and it resists contraction and won't pull back during thermal cycles so it protects sensitive electronics. Since KEY Tough-Seal is an epoxy and not a urethane, it is isocyanate-free and has a mild health and safety profile. KEY Tough-Seal is ideal for electrical potting applications requiring thermal cycling and thermal shock resistance and low embedment stress.</p>		
ADVANTAGES & APPLICATIONS	<ul style="list-style-type: none"> ✓ Excellent Thermal Cycling Performance & Thermal Shock Resistance ✓ Resilient, Tough, Durable, High Elongation ✓ Low Embedment Stress on Electronics, Low Shrinkage ✓ Adhesion to Thermoplastics and Wire Insulation, Specific Adhesion to Aluminum 		
PHYSICAL PROPERTIES <i>(Typical)</i>	Tough-Seal 21 A	Tough-Seal 21 B	MIX
	Color	Off White	Black
	Viscosity at 25°C	7,000 cP	11,000 cP
	Brookfield RVT	#5 @ 20 rpm	#5 @ 20 rpm
	Specific Gravity	1.32	1.28
	Density (lbs/gal)	11.0	10.7
CURED PROPERTIES <i>(Typical)</i>	Property	ASTM	Temperature
	Elongation at Break	D638	25°C (77°F)
	Hardness, Shore A	D2240	25°C (77°F)
			Value
			225%
			64A
	<i>Comprehensive electrical & thermal mechanical properties are listed on following pages. Visit tough-seal.com for greater discussion on the features of Tough-Seal 21.</i>		
CURE SCHEDULE <i>(Typical)</i>	Gel Time (100g):		10 minutes at 25°C (77°F)
	Hard Cure		Overnight at 25°C (77°F)
	Full Cure		3 to 5 Days, Dependent on part size
	Accelerated Cure		Yes, Mild Heating 66 to 80°C (150-175°F)
INSTRUCTIONS FOR USE	MIX RATIO By	WEIGHT	VOLUME
	KEY Tough-Seal 21 Part A	51 A	1 A
	KEY Tough-Seal 21 Part B	100 B	2 B
	Combine Part A and B and mix thoroughly, being careful to limit entrapped air during mixing. Scrape sides, walls and bottom of container. Pour material into part and cure. Bulk meter-mix dispensing machines and convenient cartridges provide air free mixing.		
SAFETY & HANDLING	PLEASE READ MATERIAL SAFETY DATA SHEET BEFORE USING. Avoid all contact with skin, eyes, clothing and food. Wash thoroughly after handling.		
SHELF LIFE & STORAGE INFO <i>For Unopened, Factory Sealed Containers</i>	KEY Tough-Seal 21A (PC2021A)	3 Months from Date of Manufacture (15°C to 35°C)	
	KEY Tough-Seal 21A (PC2021A)	12 Months from Date of Manufacture (-18°C to 3°C)	
	KEY Tough-Seal 21B (PC2021B)	12 Months from Date of Manufacture (-18°C to 35°C)	
	KEY Tough-Seal 21 Cartridges	3 Months from Date of Shipment (15°C to 35°C)	
	KEY Tough-Seal 21 Cartridges	12 Months from Date of Shipment (-18°C to 3°C)	

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KEY POLYMER

CORPORATION

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SPECIALTY CHEMICAL COMPOUNDS

17 Shepard Street, Lawrence, MA 01843-1023 ■ 978/683-9411 ■ FAX 978/686-7729

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	KEY TOUGH-SEAL 21 (KEY PC2021A/B) <i>SEALANT FOR THERMAL CYCLING</i>				
CURED PROPERTIES <i>(Typical) Page 2</i>	Electrical Properties				
		ASTM	Temperature	Value	
	Dielectric Strength	D149	25°C (77°F)	350 Volts/mil	
	Volume Resistivity	D257	25°C (77°F)	1.2 x 10 ¹² Ω-cm	
	Dielectric Constant	1 MHz	D150	25°C (77°F)	5.00
		1 kHz	D150	25°C (77°F)	5.50
		60 Hz	D150	25°C (77°F)	5.75
	Dissipation Factor	1 MHz	D150	25°C (77°F)	0.026
		1 kHz	D150	25°C (77°F)	0.028
		60 Hz	D150	25°C (77°F)	0.064
	Thermal Properties				
		ASTM	Condition	Value	
	Heat Capacity, Cp	E1461	25°C (77°F)	1.37 J/g°K	
	Thermal Conductivity	E1461	25°C (77°F)	0.26 W/m°K	
	Coefficient of Thermal Expansion	E831 E1545	-65°C to 75°C	135 ppm/°C	
			75°C to 100°C	0 ppm/°C	
			100°C to 150°C	75 ppm/°C	
	Mechanical Properties				
		ASTM	Condition	Value	
	Tensile Strength	D638	25°C (77°F)	450 psi	
	Elongation at Break	D638	25°C (77°F)	225%	
	Linear Shrinkage (Upon Cure)	D2256	25°C (77°F)	<0.001 in/in	
	Hardness vs Temperature Shore A	D2240	-75°C (-103°F)	88 A	
		D2240	-25°C (-13°F)	75 A	
		D2240	5°C (41°F)	69 A	
		D2240	25°C (77°F)	64 A	
		D2240	50°C (122°F)	62 A	
		D2240	66°C (150°F)	61 A	
D2240		80°C (176°F)	62 A		
D2240		100°C (212°F)	57 A		
D2240		120°C (248°F)	51 A		
D2240		150°C (302°F)	47 A		
Hardness vs RT Cure	1 Hour	D2240	25°C (77°F)	15 A	
	2 Hours	D2240	25°C (77°F)	26 A	
	4 Hours	D2240	25°C (77°F)	31 A	
	8 Hours	D2240	25°C (77°F)	35 A	
	12 Hours	D2240	25°C (77°F)	35 A	
	1 Day	D2240	25°C (77°F)	39 A	
	2 Days	D2240	25°C (77°F)	46 A	
	3 Days	D2240	25°C (77°F)	52 A	
	4 Days	D2240	25°C (77°F)	57 A	
	1 Week	D2240	25°C (77°F)	60 A	
1 Month	D2240	25°C (77°F)	68 A		

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SEALANT FOR THERMAL CYCLING

CURED PROPERTIES

(Typical) Page 3

METALLIC ADHESION	ASTM	Temperature	Value
Tensile Lap Shear Strength, 1" x 4" Adherands, 20 mil bondline gap, 1 inch overlap Co = Cohesive Bond Mode Ad = Adhesive Bond Mode			
Aluminum Bare	D1002	25°C (77°F)	540 psi [Co]
Steel Bare	D1002	25°C (77°F)	530 psi [Ad]
Steel Ground	D1002	25°C (77°F)	480 psi [Co]
Primed Steel	D1002	25°C (77°F)	530 psi [Co]
Galvanized Steel	D1002	25°C (77°F)	560 psi [Co]
Tin Plated Steel	D1002	25°C (77°F)	470 psi [Co]
Chrome Plated Steel	D1002	25°C (77°F)	560 psi [Co]
FRP ADHESION	ASTM	Temperature	Value
Tensile Lap Shear Strength, 1" x 4" Adherands, 20 mil bondline gap, 1 inch overlap Co = Cohesive Bond Mode Ad = Adhesive Bond Mode			
FRP - Polyester Fiberglass	D3163	25°C (77°F)	540 psi [Co]
Garolite G-9 Melamine/Glass	D3163	25°C (77°F)	530 psi [Co]
Garolite G-10 Epoxy/Glass	D3163	25°C (77°F)	550 psi [Co]
Garolite XX Phenolic/Paper	D3163	25°C (77°F)	570 psi [Co]
THERMOPLASTIC ADHESION	ASTM	Temperature	Value
Tensile Lap Shear Strength, 1" x 4" Adherands, 20 mil bondline gap, 1 inch overlap Co = Cohesive Bond Mode Ad = Adhesive Bond Mode			
Acrylic	D3163	25°C (77°F)	560 psi [Co]
Acrylic / PVC	D3163	25°C (77°F)	430 psi [Co]
PVC - Polyvinyl Chloride	D3163	25°C (77°F)	530 psi [Co]
CPVC - Chlorinated PVC	D3163	25°C (77°F)	660 psi [Co]
ABS Acrylonitrile Butadiene Styrene	D3163	25°C (77°F)	500 psi [Co]
PETG Polyethylene Terephthalate	D3163	25°C (77°F)	610 psi [Co]
Lexan - Polycarbonate	D3163	25°C (77°F)	520 psi [Co]
Nylon 6/6 - Polyamide	D3163	25°C (77°F)	520 psi [Co]
Polypropylene	D3163	25°C (77°F)	50 psi [Ad]
Polyethylene LDPE	D3163	25°C (77°F)	20 psi [Ad]
Polyethylene HDPE	D3163	25°C (77°F)	40 psi [Ad]
Teflon PTFE Polytetrafluoroethylene	D3163	25°C (77°F)	40 psi [Ad]
Noryl Polyphenylene Oxide/Polystyrene	D3163	25°C (77°F)	220 psi [Ad]
Ultem - Polyetherimide	D3163	25°C (77°F)	540 psi [Co]

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**KEY POLYMER CORP.
LAWRENCE, MA 01843**

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