PRODUCT INFORMATION

PRODUCT

(TYPICAL PROPERTIES)
These should not be considered as specifications.

TOUGH-SEAL 22 A/B (KEY PC2022A/B)
SEALANT FOR THERMAL CYCLING

DESCRIPTION

Tough-Seal 22 is a tough and durable two component, hybrid epoxy elastomer that features a longer gel time than Tough-Seal 21. Tough-Seal is a superior electrical potting compound with excellent thermal cycling performance. 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 pull back during thermal cycles so it protects sensitive electronics. Since Tough-Seal is an epoxy and not a urethane, it does not incorporate isocyanates and Tough-Seal has a mild health and safety profile. Tough-Seal is ideal for electrical potting applications requiring thermal cycling and thermal shock resistance and low embedment stress.

ADVANTAGES & APPLICATIONS

- ✓ 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 *(Typical)*

	Tough-Seal 22 A	Tough-Seal 22 B	MIX
Color	Off White	Black	Grey / Black
Viscosity at 25°C	11,000 cP	11,000 cP	11,000 cP
Brookfield RVT	#5 @ 20 rpm	#5 @ 20 rpm	#5 @ 20 rpm
Specific Gravity	1.35	1.28	1.31
Density (lbs/gal)	11.3	10.7	10.9

CURED PROPERTIES *(Typical)*

Property	ASTM	Temperature	Value
Elongation at Break	D638	25°C (77°F)	250%
Hardness, Shore A	D2240	25°C (77°F)	68A

Comprehensive electrical & thermal mechanical properties are listed on following pages.
***Visit tough-seal.com** for greater discussion on the features of Tough-Seal 22.*

CURE SCHEDULE *(Typical)*

Gel Time (100g):	60 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
Tough-Seal 22 Part A	53 A	1 A
Tough-Seal 22 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

For Unopened, Factory Sealed Containers

Tough-Seal 22A (PC2022A)	12 Months from Date of Manufacture (-18°C to 35°C)
Tough-Seal 22B (PC2022B)	12 Months from Date of Manufacture (-18°C to 35°C)
Tough-Seal 22AB Cartridges	12 Months from Date of Shipment (-18°C to 35°C)

KEY POLYMER CORPORATION
All sales subject to terms & conditions on reverse side.
SPECIALTY CHEMICAL COMPOUNDS
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CURED PROPERTIES
(Typical) Page 2

Electrical Properties		**ASTM**	**Temperature**	**Value**
Dielectric Strength		D149	25°C (77°F)	350 Volts/mil
Volume Resistivity		D257	25°C (77°F)	3.75 x 10^{12} Ω-cm
Dielectric Constant	1 MHz	D150	25°C (77°F)	5.00
	1 kHz	D150	25°C (77°F)	5.45
	60 Hz	D150	25°C (77°F)	5.85
Dissipation Factor	1 MHz	D150	25°C (77°F)	0.021
	1 kHz	D150	25°C (77°F)	0.034
	60 Hz	D150	25°C (77°F)	0.089
Thermal Properties		**ASTM**	**Condition**	**Value**
Heat Capacity, Cp		E1461	25°C (77°F)	1.42 J/g°K
Thermal Conductivity		E1461	25°C (77°F)	0.29 W/m°K
Coefficient of Thermal Expansion		E831 E1545	-65°C to 75°C	145 ppm/°C
			75°C to 100°C	0 ppm/°C
			100°C to 150°C	155 ppm/°C
Mechanical Properties		**ASTM**	**Condition**	**Value**
Tensile Strength		D638	25°C (77°F)	550 psi
Elongation at Break		D638	25°C (77°F)	250%
Linear Shrinkage (Upon Cure)		D2256	25°C (77°F)	<0.001 in/in
Hardness vs Temperature Shore A		D2240	-75°C (-103°F)	91 A
		D2240	-25°C (-13°F)	78 A
		D2240	5°C (41°F)	70 A
		D2240	25°C (77°F)	68 A
		D2240	50°C (122°F)	66 A
		D2240	66°C (150°F)	69 A
		D2240	80°C (176°F)	68 A
		D2240	100°C (212°F)	64 A
		D2240	120°C (248°F)	54 A
		D2240	150°C (302°F)	53 A
Hardness vs RT Cure	1 Hour	D2240	25°C (77°F)	0 A
	2 Hours	D2240	25°C (77°F)	10 A
	4 Hours	D2240	25°C (77°F)	17 A
	8 Hours	D2240	25°C (77°F)	30 A
	12 Hours	D2240	25°C (77°F)	35 A
	1 Day	D2240	25°C (77°F)	48 A
	2 Days	D2240	25°C (77°F)	56 A
	3 Days	D2240	25°C (77°F)	61 A
	4 Days	D2240	25°C (77°F)	65 A
	1 Week	D2240	25°C (77°F)	65 A
	1 Month	D2240	25°C (77°F)	71 A

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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)	740 psi [Co]
Steel Bare	D1002	25°C (77°F)	480 psi [Ad]
Steel Ground	D1002	25°C (77°F)	600 psi [Co]
Primed Steel	D1002	25°C (77°F)	560 psi [Co]
Galvanized Steel	D1002	25°C (77°F)	700 psi [Co]
Tin Plated Steel	D1002	25°C (77°F)	600 psi [Co]
Chrome Plated Steel	D1002	25°C (77°F)	490 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)	460 psi [Co]
Garolite G-9 Melamine/Glass	D3163	25°C (77°F)	620 psi [Co]
Garolite G-10 Epoxy/Glass	D3163	25°C (77°F)	690 psi [Co]
Garolite XX Phenolic/Paper	D3163	25°C (77°F)	520 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)	620 psi [Co]
Acrylic / PVC	D3163	25°C (77°F)	600 psi [Co]
PVC - Polyvinyl Chloride	D3163	25°C (77°F)	570 psi [Co]
CPVC - Chlorinated PVC	D3163	25°C (77°F)	670 psi [Co]
ABS Acrylonitrile Butadiene Styrene	D3163	25°C (77°F)	580 psi [Co]
PETG Polyethylene Terephthalate	D3163	25°C (77°F)	610 psi [Co]
Lexan - Polycarbonate	D3163	25°C (77°F)	630 psi [Co]
Nylon 6/6 - Polyamide	D3163	25°C (77°F)	620 psi [Co]
Polypropylene	D3163	25°C (77°F)	30 psi [Ad]
Polyethylene LDPE	D3163	25°C (77°F)	0 psi [Ad]
Polyethylene HDPE	D3163	25°C (77°F)	20 psi [Ad]
Teflon PTFE Polytetrafluoroethylene	D3163	25°C (77°F)	10 psi [Ad]
Noryl Polyphenylene Oxide/Polystyrene	D3163	25°C (77°F)	200 psi [Ad]
Ultem - Polyetherimide	D3163	25°C (77°F)	630 psi [Co]

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KEY POLYMER CORP.
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February 3, 2003