LOCTITE® TECHNOMELT®

sonderhoff

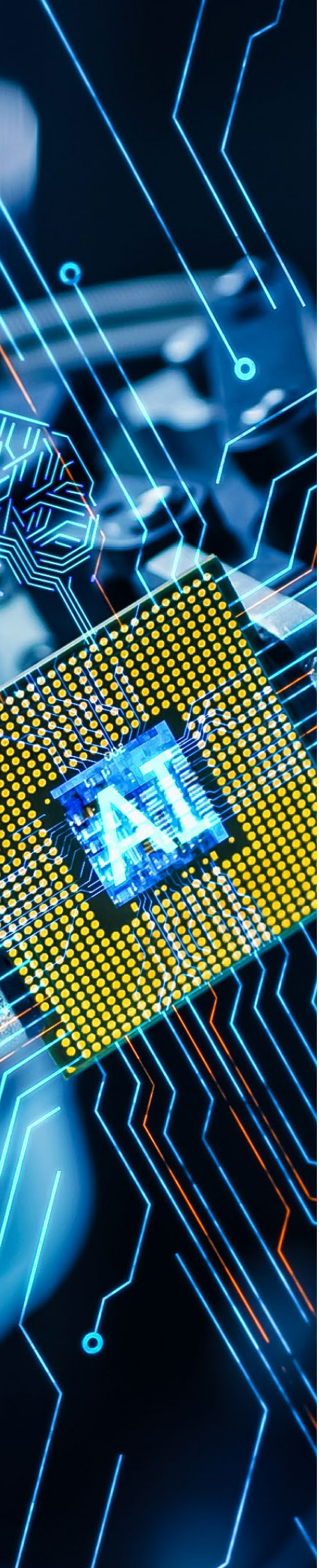
BERGQUIST®

MATERIAL SOLUTIONS FOR
NEXT GENERATION INDUSTRIAL AUTOMATION

Formulated for Continuous Performance and Sustainable Results

Henkel

Henkel Adhesive Technologies



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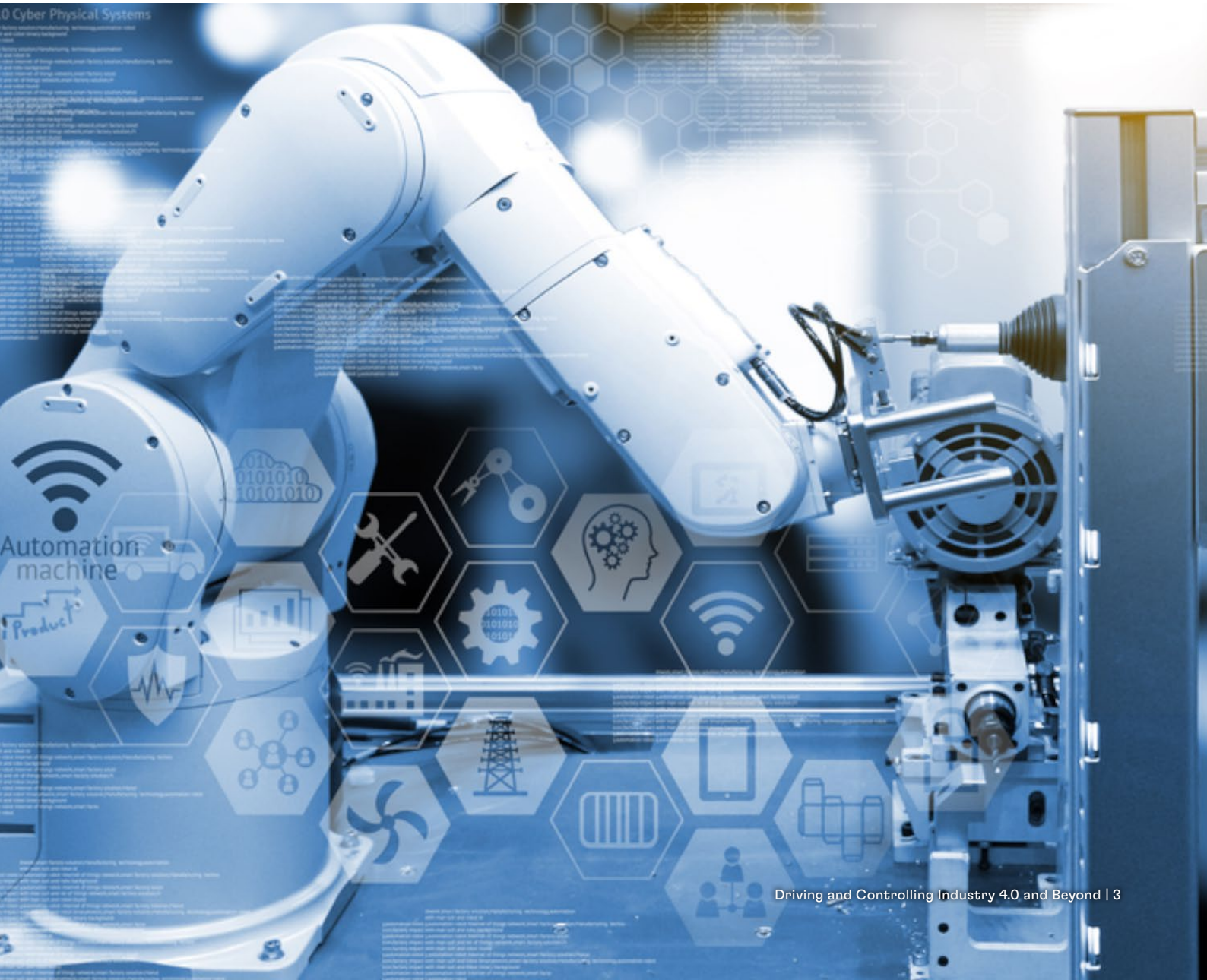
DRIVING AND CONTROLLING INDUSTRY 4.0 AND BEYOND

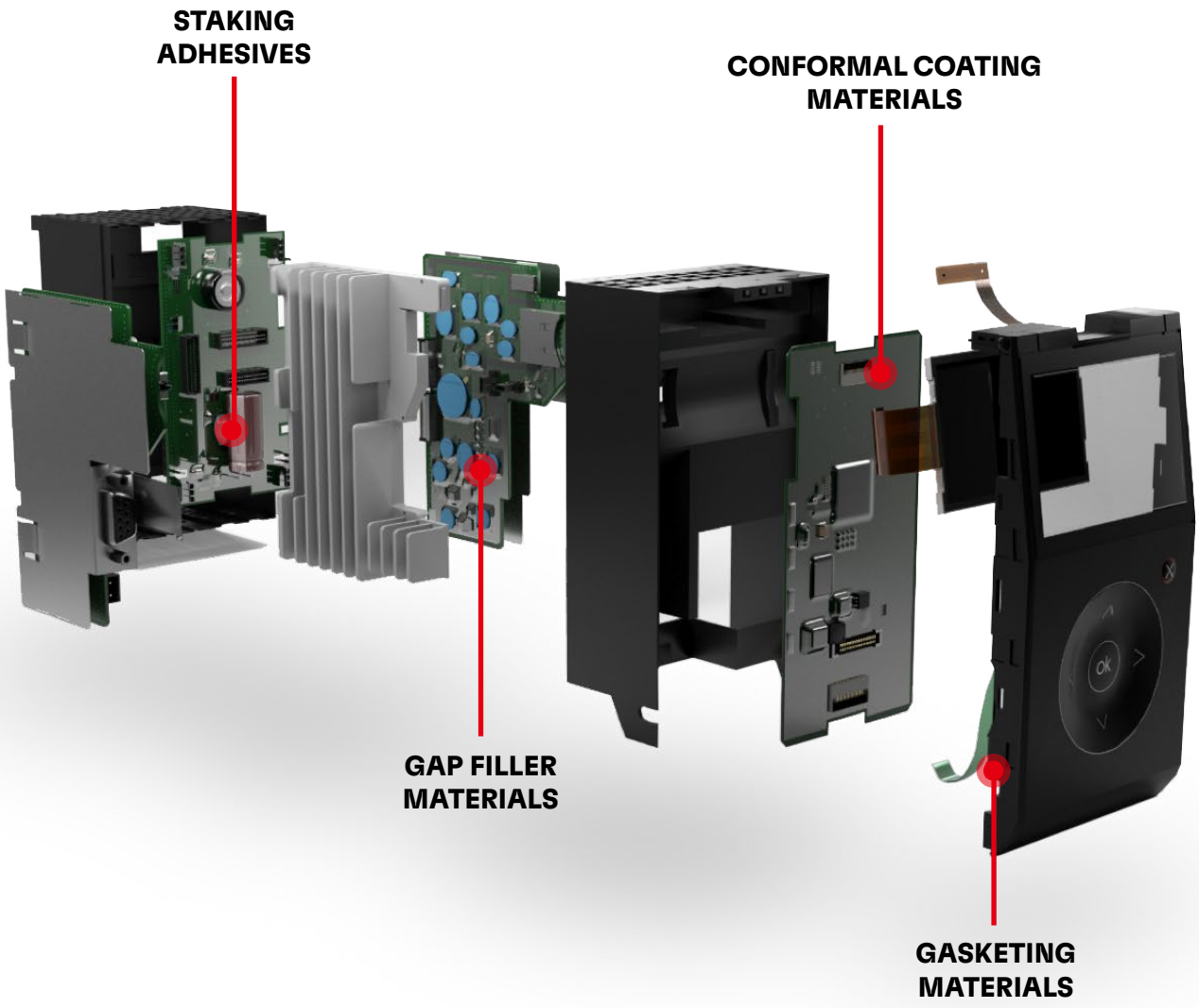
Today's motor drives and industrial controls are undergoing significant transformation as manufacturing moves from conventional linear operation to a connected, integrated Industry 4.0 ecosystem. The Smart Factory environment dictates precise control, real-time communication functionality and actionable analysis capability, all of which must be integrated into increasingly smaller footprints. At the same time, the ruggedness and durability of these systems must continue to be prioritized, as harsh environments are often the norm.

The achievement of these objectives is having a profound effect on the electronic foundation of modern-day drives and controls. Component and power densities are increasing, high reliability is a prerequisite and resilience to constant operation and tough environments is the expectation. The convergence of these factors requires advanced materials that can securely bond disparate surfaces, move heat away from critical components, ensure reliable electronic interconnects and protect systems from chemicals, moisture and stress. Delivering on these requirements, Henkel's broad, high-performance portfolio of materials bonds, connects, protects and cools next-generation industrial automation technologies, enabling the factory of the future.



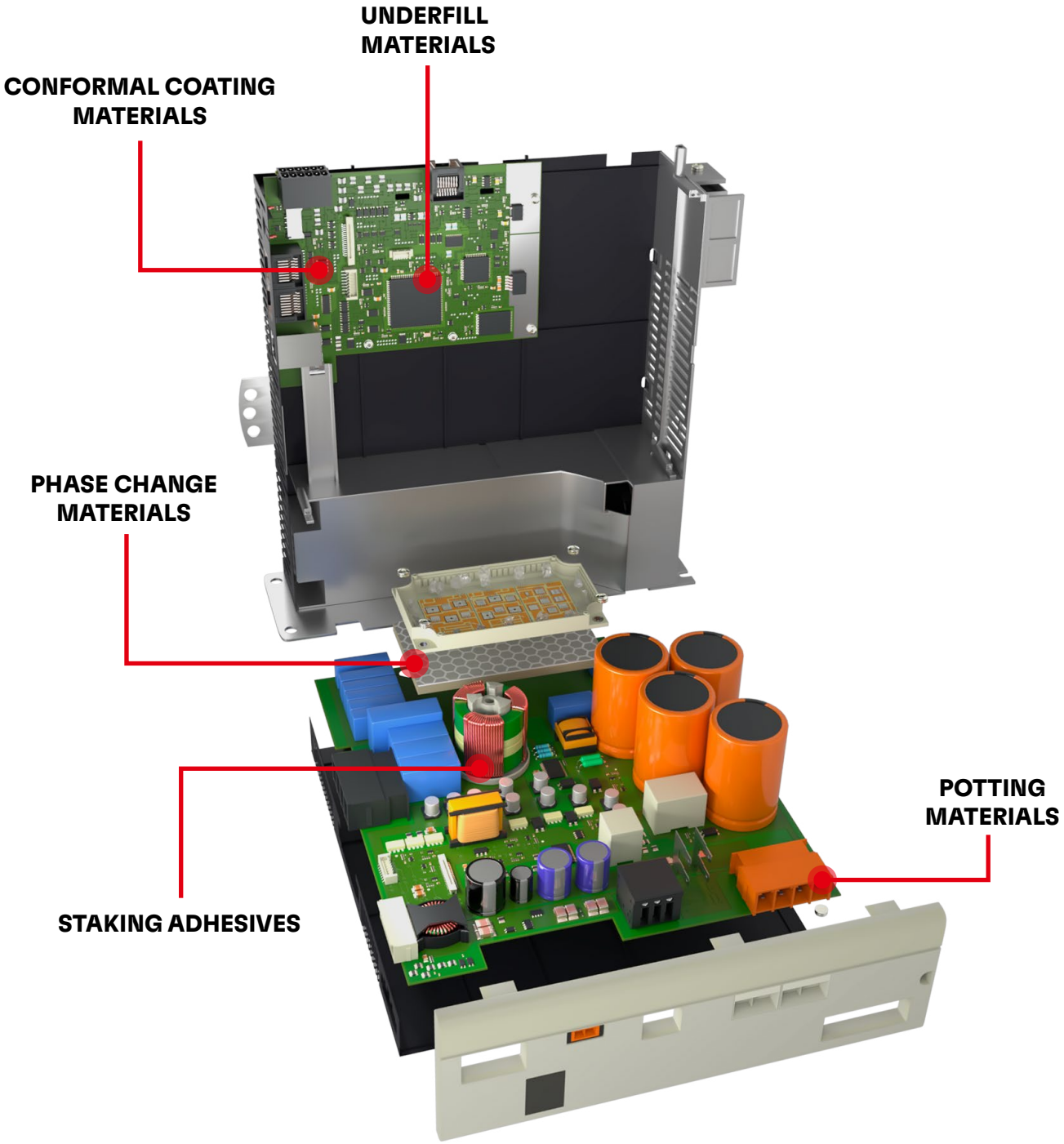
MATERIAL SOLUTIONS FOR

Programmable Logic Controller (PLC)



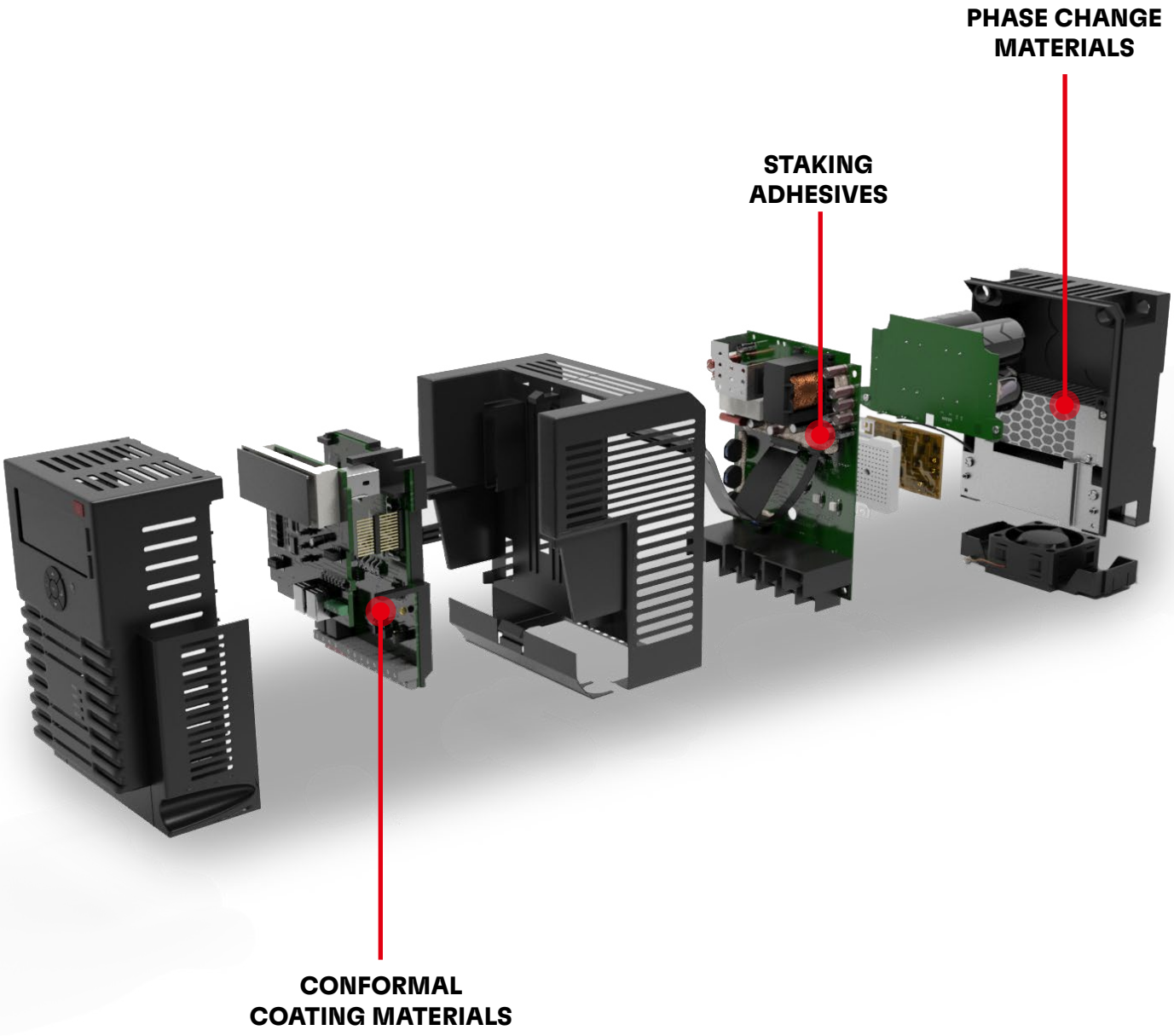
MATERIAL SOLUTIONS FOR

Servo Drive



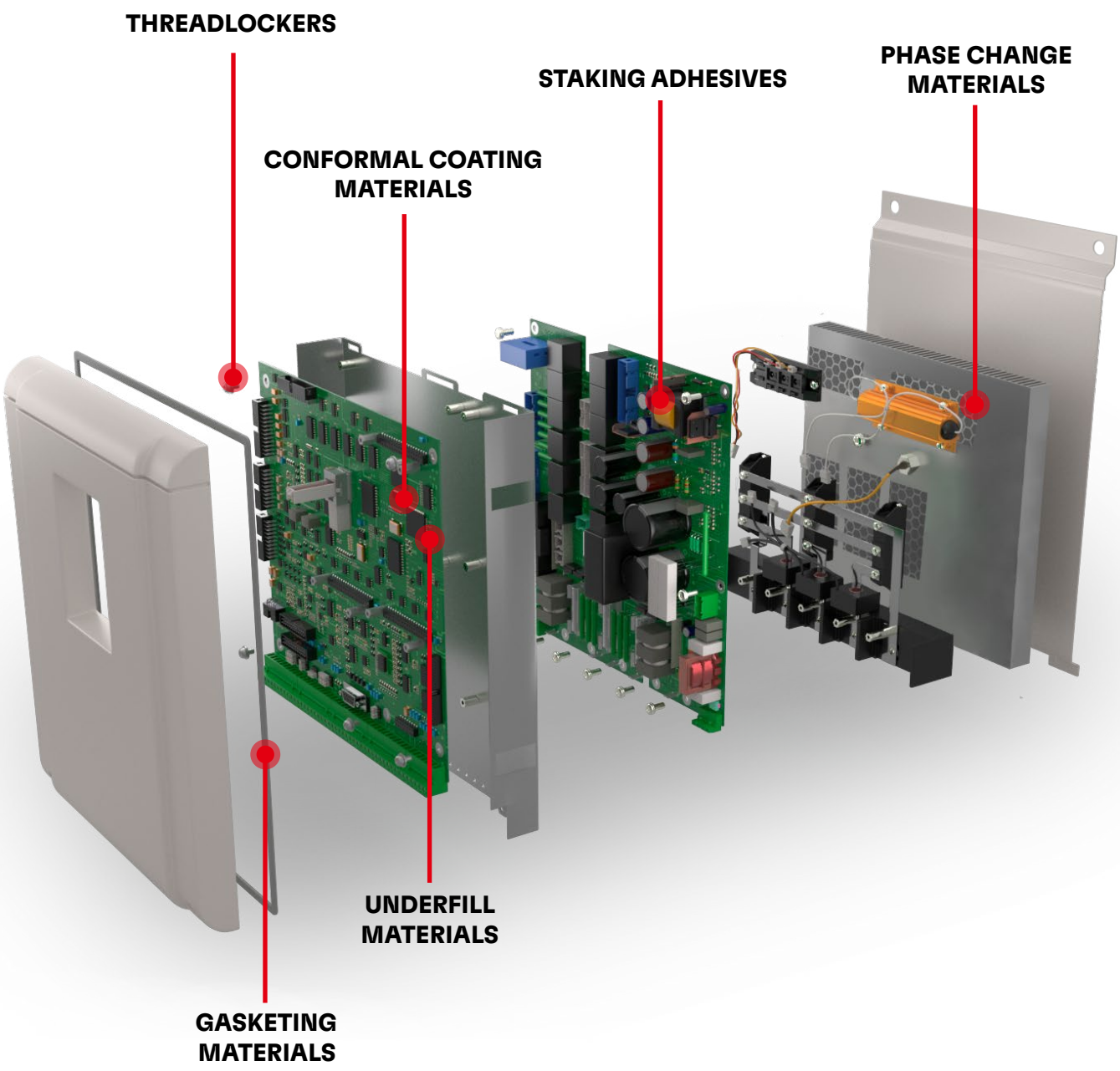
MATERIAL SOLUTIONS FOR

Variable-Frequency Drive (VFD)



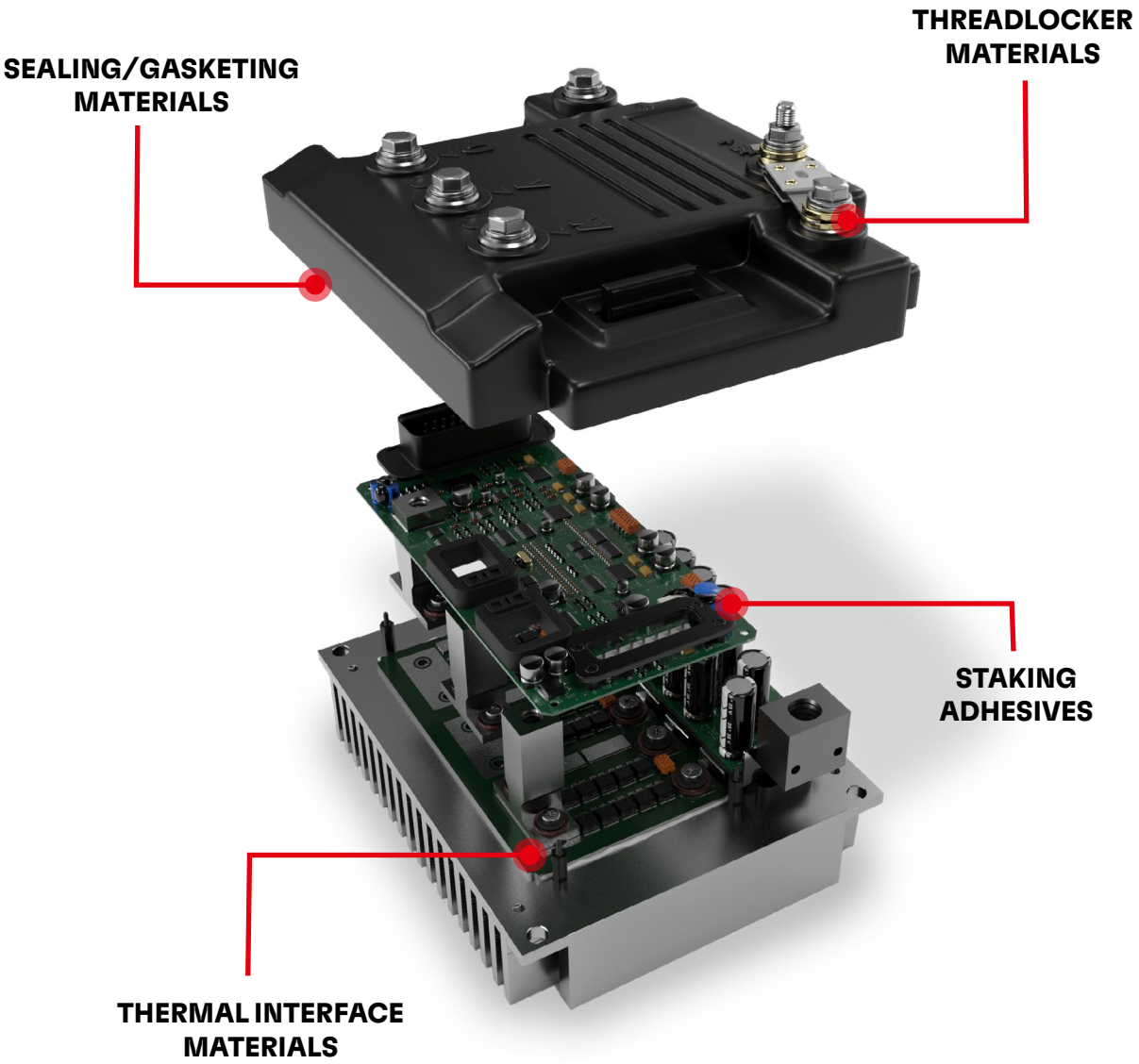
MATERIAL SOLUTIONS FOR

DC Drive



MATERIAL SOLUTIONS FOR

Motor Controller



BONDING MATERIALS FOR INDUSTRIAL AUTOMATION

BONDING MATERIALS

Motor drives, motor controls, PLCs, PACs and industrial PCs are the brains of the production operation, controlling electromechanical processes, motor speed and precision. In order to work reliably on demand, structural integrity is vital. Screws and clips must stay in place; critical components like transformers and magnetic coils require strong bonds to remain in position during operation; and housings and covers that offer internal system protection must be secure. Henkel's threadlockers, staking adhesives and structural bonding formulations provide strong adhesion on multiple surfaces with resistance to degradation from operational wear and tear. Available in multiple chemistry platforms, including silicone-free, Henkel bonding materials are a strong, space-saving, reliability-enhancing alternative to conventional joining techniques.

BONDING MATERIALS FOR INDUSTRIAL AUTOMATION

ASSEMBLY ADHESIVES		CHIPBONDER	THREADLOCKER
ACRYLIC	EPOXY	EPOXY	ACRYLIC
LOCTITE® AA 3103	LOCTITE® ABLESTIK 2151	LOCTITE® 3609	LOCTITE® 243
	LOCTITE® ABLESTIK 2332	LOCTITE® 3616	LOCTITE® 248
	LOCTITE® ABLESTIK 3128	LOCTITE® 3627	
	LOCTITE® ABLESTIK G 500		

ASSEMBLY ADHESIVES

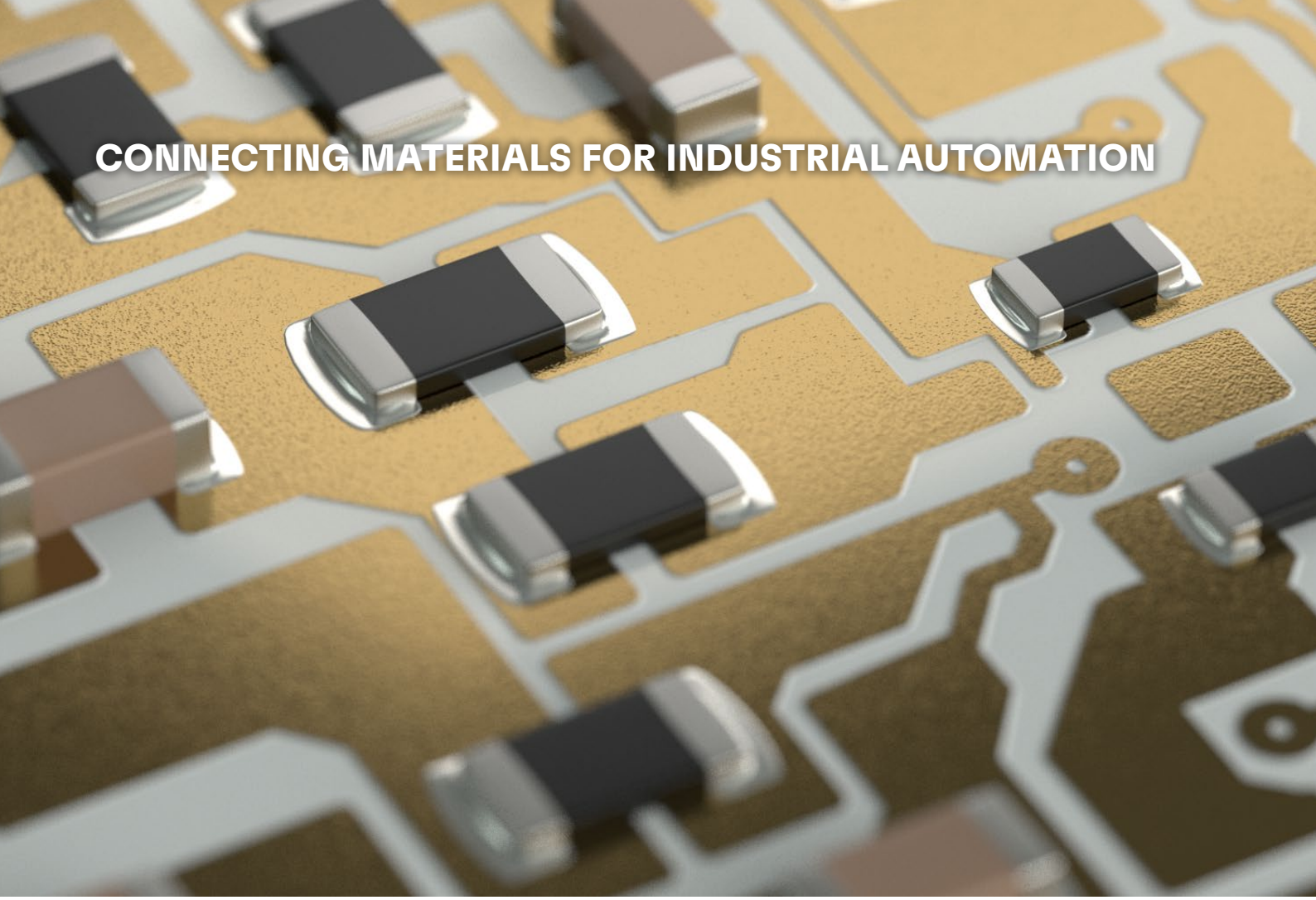
Product Name	Description	Viscosity (cPs)	Volume Resistivity (Ω·cm at 25°C)	Application	Cure Schedule
	Acrylic				
LOCTITE® AA 3103	Cures rapidly to form flexible, transparent bonds when exposed to ultraviolet light and/or visible light of sufficient irradiance and has shown excellent adhesion to a wide variety of substrates including glass, many plastics and most metals	11,250	-	Assembly Adhesive	50 mW/cm^3 at 5 sec.
	Epoxy				
LOCTITE® ABLESTIK 2151	Thixotropic, two-part adhesive that develops strong, durable high-impact bonds at room temperature, improving heat transfer while maintaining electrical insulation	40,000	2.10x10^{15}	Assembly Adhesive	24 hr. at 25°C
LOCTITE® ABLESTIK 2332	Solventless epoxy adhesive that develops high bond strength when cured at temperatures as low as 100°C. This product combines toughness at low temperatures plus high peel and tensile shear strengths over a very broad temperature range	75,000	6.00x10^{14}	Assembly Adhesive	1 hr. at 120°C

CHIPBONDER

Product Name	Description	Viscosity (cPs)	Glass Transition Temperature, Tg (°C)	Cure Schedule
	Epoxy			
LOCTITE® 3609	Designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Particularly suited for applications where medium to high dispense speeds, high dot profile, high wet strength and good electrical characteristics are required	1,080 (Casson)	73	2 min. at 150°C
LOCTITE® 3616	Designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Particularly suited to printing a range of dot heights with one stencil thickness	35,000 (Casson)	140	2 min. at 150°C
LOCTITE® 3627	Designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Particularly suited for applications where high dispense speeds, high dot profile, high wet strength and good electrical characteristics are required. The product is also suitable for stencil print applications	35,000 (Casson)	105	2 min. at 150°C

THREADLOCKER

Product Name	Description	Color	Cure Speed	Viscosity cP at 25°C
	Acrylic			
LOCTITE® 243	General purpose threadlocker of medium bond strength. This threadlocker secures and seal bolts, nuts and studs to prevent loosening due to vibration	Blue	24 hr.	1,300 - 3,000
LOCTITE® 248	Medium strength anaerobic threadlocking material. It is supplied as a wax-like semi-solid, conveniently packaged in a self-feeding stick applicator	Blue, wax consistency	168 hr. at 22°C; Breakaway Torque, ISO 10964, Unseated	-



CONNECTING MATERIALS

Addressing the demands for expanded function and reduced footprints, higher density printed circuit boards with fine-pitch interconnects are being employed for modern-day, Industry 4.0-capable motor controls and high-power drives. Electrically conductive adhesives used to enable electrical function require formulations that allow precise deposits that facilitate high-integrity electrical interconnection. In addition, as manufacturers prioritize sustainability and cost-efficiency, Henkel materials manufactured with conflict-free metals that offer high reliability, low yield, temperature stability, processing ease and low cost of ownership are increasingly being specified as the go-to products for industrial applications.

CONNECTING MATERIALS FOR INDUSTRIAL AUTOMATION
ELECTRICALLY CONDUCTIVE ADHESIVES
LOCTITE® ABLESTIK 84-1LMI
LOCTITE® ABLESTIK 56C/CAT9
LOCTITE® ABLESTIK CA 3556HF
LOCTITE® ABLESTIK CE 3103WLV
LOCTITE® ABLESTIK CE 3104WXL
LOCTITE® ABLESTIK ICP 4000
LOCTITE® ABLESTIK CE 8500

ELECTRICALLY CONDUCTIVE ADHESIVES

Product Name	Description	Viscosity at 25°C (cPs)	Modulus at 25°C (MPa)	Volume Resistivity (Ω·cm)	Cure Schedule
	Epoxy				
LOCTITE® ABLESTIK 56C CAT9	Designed to make electrical connections where hot soldering is impractical or to make electrical connections to conductive plastics at locations which cannot be subjected to high temperatures, passes NASA outgassing standards	–	–	0.0004	2 hr. at 50C
LOCTITE® ABLESTIK CA 3556HF	An electrically conductive adhesive designed for applications that require a very fast cure at low temperatures. It is ideally suited for high throughput production processes and applications where high peel strength is desired	31,500	650	0.0025	<15 sec. at 130°C
LOCTITE® ABLESTIK CE 3103WLV	An electrically conductive epoxy adhesive that is a Pb-free alternative to solder	20,000	4,500	0.0008	10 min. at 120°C or 3 min. at 150°C
LOCTITE® ABLESTIK CE 3104WXL	An electrically conductive epoxy adhesive that is a Pb-free alternative to solder. This product uses tightly controlled particle sizes to provide ultra-fine pitch resolution (< 500 µm) when printed using either a stainless-steel mesh screen or a metal mask stencil	65,000	4,500	–	5 min. at 125°C
LOCTITE® ABLESTIK ICP 4000	A silicone based, electrically conductive adhesive. It is specially designed for applications where both high flexibility and excellent conductivity are required. This material is also recommended for use in mounting small components to a variety of interconnect substrates	30,000	120	6×10^{-5}	35 min. at 140°C
LOCTITE® ABLESTIK 84-1LMI	Designed for microelectronic chip bonding applications. This adhesive is ideal for application by automatic dispenser or hand probe	30,000	4,695	0.0005	1 hr. at 150°C or 2 hr. at 125°C
LOCTITE® ABLESTIK CE 8500	Solventless epoxy adhesive that combines low stress with good adhesion on nearly all surfaces	120,000 – 140,000	–	3.5×10^{13}	1 hr. at 150°C

PROTECTING MATERIALS FOR INDUSTRIAL AUTOMATION

Industrial motors, drives, and controls – regardless of the industry – often stay in service well past their design life, so a long lifespan is the expectation and protection of all components is an essential manufacturing consideration. From conformal coatings to shield PCBs from moisture and contaminants, to the potting of integrated drives and traction applications for ultimate environmental defense, to gasketing materials that allow system servicing if required, Henkel's comprehensive portfolio of protection materials can help satisfy the high-performance and longevity demands of the future-proofed factory.

PROTECTING MATERIALS FOR INDUSTRIAL AUTOMATION

CIRCUIT BOARD PROTECTION

CONFORMAL COATING	LOW PRESSURE MOLDING
LOCTITE® STYCAST PC 40-UMF	TECHNOMELT® PA 646
LOCTITE® STYCAST PC 62	TECHNOMELT® PA 678
LOCTITE® STYCAST SI 5293	TECHNOMELT® PA 2692
LOCTITE® STYCAST SI 5296	TECHNOMELT® PA 6208 N BLACK
LOCTITE® STYCAST UV 7992	TECHNOMELT® PA 6481
LOCTITE® STYCAST CC 8555	TECHNOMELT® PA 687

ENCAPSULANT

EPOXY
LOCTITE® ECCOBOND EO 1061
LOCTITE® ECCOBOND EO 1072
LOCTITE® ECCOBOND EN 3838T
LOCTITE® ABLESTIK EN 3839
LOCTITE® ECCOBOND FP4450
LOCTITE® ECCOBOND FP4451
LOCTITE® ECCOBOND UV 9060F

SEALING/GASKETING

FORM IN PLACE FOAM GASKET (FIPFG)	CURE IN PLACE
FERMAPOR K31	LOCTITE® SI 5699
FERMASIL	LOCTITE® 5810F
	LOCTITE® SI 5910

POTTING

EPOXY	POLYURETHANE	SILICONE
LOCTITE® STYCAST 2651-40/CAT 11	LOCTITE® STYCAST US 2350	LOCTITE® STYCAST SI 5088
LOCTITE® STYCAST 1090 SI/CAT 11	LOCTITE® STYCAST US 5544	
LOCTITE® STYCAST 2850FT/CAT 11	LOCTITE® STYCAST US 5538	
LOCTITE® STYCAST 2505/CAT 11		
LOCTITE® STYCAST 2534 FR/CAT 24LV		
LOCTITE® STYCAST ES 4512		
LOCTITE® STYCAST EO 1058		
LOCTITE® STYCAST EO 7038		

UNDERFILL

EPOXY	EDGEBOND	CORNERBOND
LOCTITE® ECCOBOND UF 1173	LOCTITE® 3128	LOCTITE® 3508NH
LOCTITE® ECCOBOND E 1216M	LOCTITE® DSP 1900024/S	
LOCTITE® 3517M		
LOCTITE® ECCOBOND UF 3812		

CONFORMAL COATING

Product Name	Description	Technology	Cure Schedule	Viscosity at 25°C (cP)	Operating Temperature
LOCTITE® STYCAST PC 40-UMF	Formulated to rapidly gel and immobilize when exposed to UV light and then fully cure when exposed to atmospheric moisture, ensuring optimum performance even in shadowed areas	Urethane Acrylate	10 sec. at 300 – 600 mW/cm² [UV 365 nm] 2 – 3 days at RT	250	-40 – 135°C
LOCTITE® STYCAST PC 62	Designed to provide environmental and mechanical protection	Acrylic	24 hr. at 25°C 45 min. at 75°C	52	-40 – 125°C
LOCTITE® STYCAST SI 5293	UV + moisture cure silicone conformal coating. Designed to provide environmental protection for printed circuit boards and other sensitive electronic components	Silicone	Functional strength: 20 – 40s at > 70 mW/cm² [UV 365 nm] Tack free: 10 – 24h at 22 °C / 50±5 % RH Full strength: 3 days at 22 °C / 50±5% RH	400 – 800	-40 – 200°C
LOCTITE® STYCAST SI 5296	Designed to be applied by a variety of selective robotic dispense methods and can also be applied via brush, dip or manual spray	Silicone	Tack free: 7 min. at 125 °C, 13 min. at 108 °C	150 – 235	-40 – 200°C
LOCTITE® STYCAST UV 7993	Designed to provide rugged protection from moisture and harsh chemicals. It is compatible with industry standard solder masks, no-clean fluxes, metallization, components and substrate materials	Urethane	10 – 20 sec. at 150 – 300 mW/cm² [UV 365 nm] 100 hr. at RT / 50% RH 50 hr. at RT / > 70% RH	120	-40 – 130 °C
LOCTITE® STYCAST UV 8555	Designed to provide rugged protection from moisture and harsh chemicals, compatible with industry standard solder masks, no-clean fluxes, metallization, components and substrate materials.	Urethane Acrylate	Dual-cure (UV and moisture)	60	-40 – 130 °C

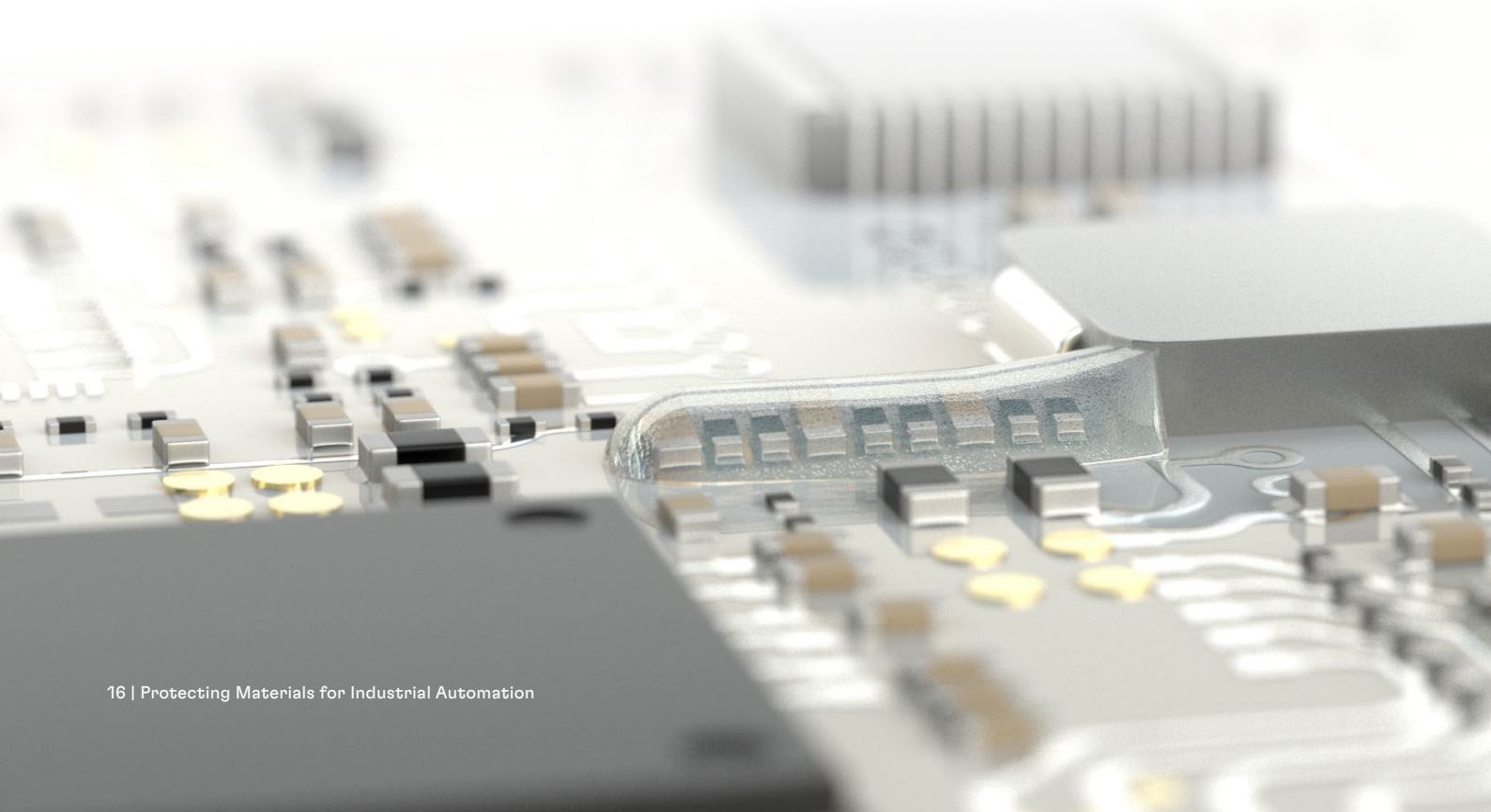
LOW PRESSURE MOLDING

Product Name	Description	Operating Temperature	Durometer	Viscosity at Temperature (cP)	Color
TECHNOMELT® PA 646*	High durometer polyamide overmolding material	-40°C – 125°C	Shore A 92	4,500 at 225°C	Black
TECHNOMELT® PA 678*	High operating temperature range polyamide overmolding material	-40°C – 140°C	Shore A 88	3,400 at 210°C	Black
TECHNOMELT® PA 2692*	Very high operating temperature range low moisture uptake polyamide overmolding material	-20°C– 175°C	Shore D 67	4,250 at 240°C	Amber
TECHNOMELT® PA 6208 N BLACK*	High performance thermoplastic polyamide is designed to meet low pressure molding process requirements	190°C – 230°C	Shore A 78	3,600 at 210°C	Black
TECHNOMELT® PA 6481*	UV stabilized material for direct sunlight applications	-40°C – 125°C	Shore A 90	7,300 at 210°C	Black
TECHNOMELT® PA 687*	Thermoplastic, hot melt adhesive is designed for molding compound applications	-40°C – 140 °C	Shore A 87	4,900 at 225°C	Black

*For details regarding UL certification of Henkel's family TECHNOMELT® materials, please refer to UL file E182771 or contact our technical customer service group

ENCAPSULANT

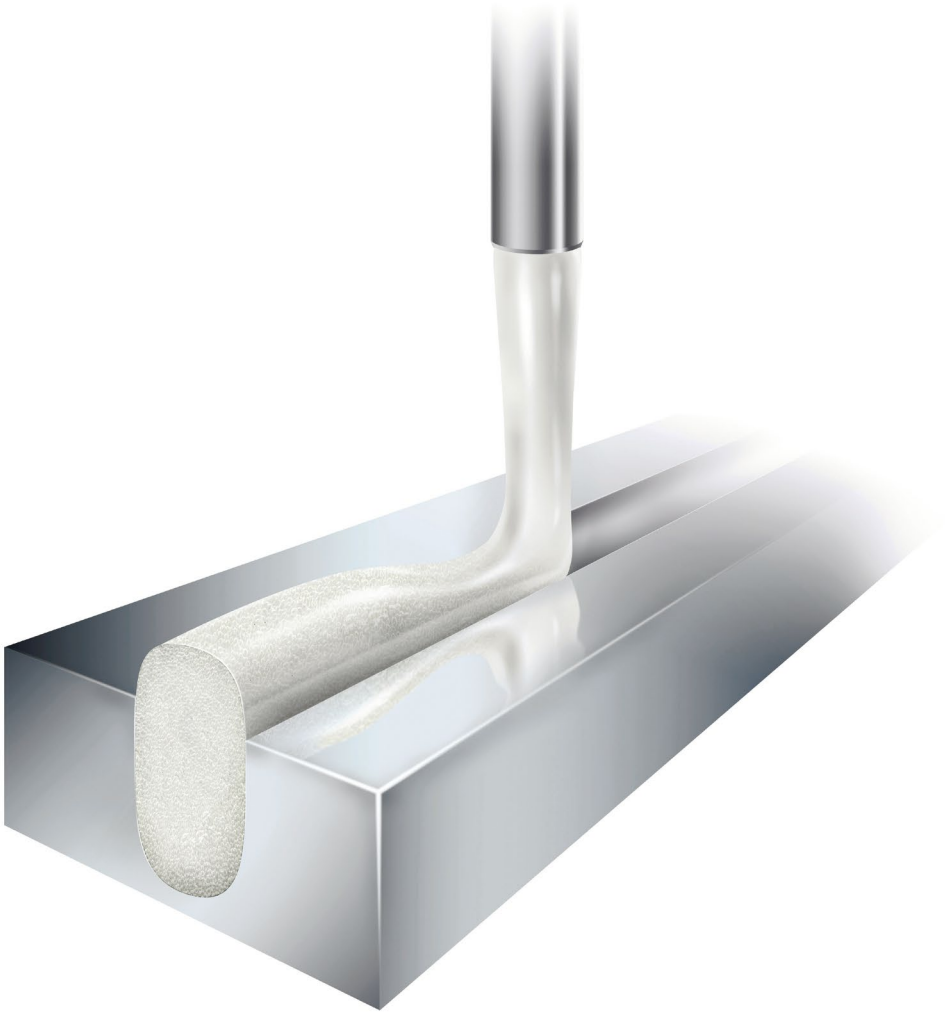
Product Name	Description	Viscosity at 25°C (cP)	Glass Transition Temperature, T_g (°C)	Coefficient of Thermal Expansion, CTE (ppm/°C)		Pot Life at 25°C (Days)	Cure Schedule
				Above T_g	Below T_g		
LOCTITE® ECCOBOND EO 1061	Medium glob Chip-On-Board 1K epoxy encapsulant	50,000	125	–	40	25 days at 25°C	3 hr. at 140°C
LOCTITE® ECCOBOND EO 1072	One component epoxy with unique rheology that allows the product to be used both as a dam and fill encapsulant	100,000	135	123	43	30 days at 25°C	5 min. at 150°C
LOCTITE® ECCOBOND EN 3838T	Designed to provide a flexible, low T_g material for encapsulating components on a PCB	6,700	2	217	57	3 days at 25°C	8 min. at 130°C
LOCTITE® ECCOBOND EN 3839	Specially designed for encapsulating components on PCB applications. Stable electrical performance in temperature humidity bias	7,800	26	211	108	2 days at 25°C	2,000 mJ/cm² - 365 nm > 10 min. at 130°C
LOCTITE® ECCOBOND FP4450	Encapsulant designed for protection of bare semiconductor devices. High purity, low stress with good moisture resistance	43,900	155	–	22	3 days at 25°C	31 min. at 125°C + 90 min. at 165°C
LOCTITE® ECCOBOND FP4451	Damming material designed as a flow control barrier around areas of bare chip encapsulation. It is a high purity green product with minimal slumping. Use together with LOCTITE® ECCOBOND FP4450	1,300,000	155	–	22	2 days at 25°C	30 min. at 125°C + 90 min. at 165°C
LOCTITE® ECCOBOND UV 9060F	Fast cure, no flow, UV/moisture cure encapsulant designed for local circuit board protection. This product is fluorescent when viewed with ultraviolet (black) light	11,000	75	198	81	–	5 – 25 sec. at 566 mW/cm²



GASKETING/SEALING

Product Name	Description	Flame Retardancy	Water Absorption	Compression Load Deflection	Temperature Resistance	Compression set (DVR)
FERMAPOR K31	Two-component room-temperature crosslinking polyurethane soft foam system	Up to UL-94 HF-1 possible	From < 3.5 %, hydrophobic versions available	From 5 – 200 kPa (at 25% compression)	From -40°C – +100°C (short time up to +160)	< 97 % depending on test conditions
FERMASIL	Two-component room-temperature crosslinking silicone foam system	Up to UL-94 V-0 possible	App. 1	From 20 – 150 kPa (at 25% compression)	From -60°C – +180°C (short time up to +350)	< 97 % depending on test conditions

Product Name	Description	Chemistry	Viscosity (cP)	Cure Condition (25°C / 50±5 % RH)	Cure Type
LOCTITE® 5810F	Form in place gasketing primarily designed for sealing plastic and metal housings on electronic components	Polyacrylate	Paste	≤ 120 min.	RTV
LOCTITE® SI 5910	One-component, silicone sealant designed for sheet metal covers with good oil resistance	Oxime Silicone	Paste	≤ 40 min.	RTV
LOCTITE® SI 5699	One-component, silicone sealant has excellent adhesion and can be used to seal electronic components	Oxime Silicone	Paste	≤ 30 min.	RTV



POTTING MATERIALS

Product Name	Description	Cure Schedule	Viscosity at 25°C (cP)	Working Life	Shore Hardness	Flammability Rating
		Epoxy - two part				
LOCTITE® STYCAST 2651-40/CAT 11	General purpose epoxy potting material	12 hr. at 80°C 3 hr. at 100°C 45 min. at 120°C	4,000	> 4 hr. for 100 g mass at 25°C	88D	–
LOCTITE® STYCAST 1090 SI/CAT 11	Lightweight epoxy potting material	8 – 16 hr. at 80°C 2 – 4 hr. at 100°C 30 – 60 min. at 120°C	3,500	> 4 hr. for 100 g mass at 25°C	80D	–
LOCTITE® STYCAST 2850FT/CAT 11	Thermally conductive epoxy potting material	8 – 16 hr. at 80°C 2 – 4 hr. at 100°C 30 – 60 min. at 120°C	64,000	4 hr. for 100 g mass at 25°C	96D	–
LOCTITE® STYCAST 2505 /CAT 11	Flame-retardant general-purpose epoxy potting material	8 – 16 hr. at 80°C 2 – 4 hr. at 100°C 30 – 60 min. at 120°C	5,000	> 4 hr. for 100 g mass at 25°C	72D	UL 94 V-0 at 6 mm thickness
LOCTITE® STYCAST 2534 FR/CAT 24LV	Flame-retardant general-purpose epoxy potting material	4 hr. at 65°C	3,290	–	91D	UL 94 V-0 at 6 mm thickness
LOCTITE® STYCAST ES 4512	Flame-retardant general-purpose epoxy potting material	Gel time: 5 hr. at 25°C 36 – 48 hr. at 25 °C, 3 hr. at 60°C	19,000	1 hr. for 200 g mass at 25°C	88D	–

Product Name	Description	Cure Schedule	Viscosity at 25°C (cP)	Pot life at 25°C	Shore Hardness
	Epoxy - One part				
LOCTITE® STYCAST EO 1058	One component heat cured epoxy potting material. Provides excellent environmental and thermal protection to encapsulated parts	Gel time: 12 min. at 121°C 2 hr. at 140°C 3 hr. at 125°C	50,000	10 days	90D
LOCTITE® STYCAST EO 7038	One component heat cured epoxy potting material	3 hr. at 130°C 2 hr. at 140°C 2 hr. at 90°C + 2 hr. at 130°C	40,000	3 days	92D
	Polyurethane				
LOCTITE® STYCAST US 2350	Flexible, flame retardant, mineral filled, polyurethane compound. This potting compound has long pot life, and is low viscosity so it flows well and adheres to many substrates	Gel time: 90 min. at 23°C (300 g) Cure: 12 – 24 hr. at 23°C or 1 – 3 hr. at 65 – 85°C	2,400	45 min.	85A
LOCTITE® STYCAST US 5544	Fast gelling, flexible, flame retardant, mineral-filled, polyurethane compound. This system is low in viscosity and adheres well to many substrates	Gel time: 4 – 6 min. Cure: 2 – 4 hr. at 23°C or 30 min. at 60 – 85°C	2,000	2 – 3 min.	79 – 89A
LOCTITE® STYCAST US 5538	Flexible, unfilled, potting compound. This system is low in viscosity for good flow and good adhesion to many substrates	Gel time: 45 – 75 min. at 25°C (105 g) Cure: 24 – 48 hr. at 25°C or 1 – 3 hr. at 60 – 85°C	450	20 – 40 min.	65A
	Silicone				
LOCTITE® STYCAST SI 5088	UV + moisture cure silicone for shallow potting	20 sec. at > 30 mW/cm² [UV 365nm]	50,000 – 80,000	–	25A

UNDERFILL

Product Name	Description	Cure Schedule	Viscosity at 25°C (cP)	Coefficient of Thermal Expansion, CTE (ppm/°C)		Glass Transition Temperature, T_g (°C)	Pot Life
				Above T_g	Below T_g		
		Epoxy					
LOCTITE® ECCOBOND UF 1173	Designed to provide a uniform and void-free encapsulant underfill, maximizing the device's temperature cycling capability, distributing stress away from solder connects thus enhancing solder joint reliability in CSP and BGA packages	5 min. at 150°C	7,500	103	26	160	2
LOCTITE® ECCOBOND E 1216M	Non-anhydride underfill designed for high volume assembly operations requiring a very fast flowing underfill that fully cures in a single reflow cycle	4 min. at 150°C	4,000	131	35	125	5
LOCTITE® 3517M	Reworkable, low temp cure underfill designed for use as a solder joint protection against mechanical stress in handheld electronic device applications	10 min. at 100°C	2,600	191	65	78	7
LOCTITE® ECCOBOND UF 3812	Reworkable epoxy underfill designed for CSP, WLCSP and BGA applications. This low viscosity material is formulated to flow at room temperature with no additional preheating required	> 10 min. at 130°C	350	175	48	131	3
		EDGEBOND					
LOCTITE® 3128NH	Low temperature cure EDGEBOND material ideal for use on heat sensitive components	20 min. at 80 °C	17,000	130	40	45	21
LOCTITE® DSP 190024/S	UV cure edge bond material designed for high throughput assembly operations	Light Source and Condition: Zeta 7411 UV Flood System Light Intensity, (mW/cm^2) – 30 UV Wavelength, (nm) – 365 Time, (sec.) – 80	44,000	66	151	77	30
		CORNERBOND					
LOCTITE® 3508NH	Designed to cure during Pb-free solder reflow while allowing self-alignment of IC components. It can be pre-applied to the board at the corners of the pad site using a standard SMA dispenser	3 hr. at 180°C	70,000	175	65	118	–

THERMAL MATERIALS FOR INDUSTRIAL AUTOMATION

THERMAL MANAGEMENT

The increased power densities for smaller, higher functioning motor controls and drives often result in more heat generation. This, combined, with 24/7 operational expectations make thermal management a key factor for reliable performance. Award-winning BERGQUIST® thermal management materials from Henkel in pad, liquid, gel and phase change formulations offer a solution for any heat-producing application within drive and control systems. High thermal conductivity for maximum heat dissipation, conformability for low stress, low volatility and silicone-free chemistries to limit outgassing concerns, and UL-certified safety ratings are all attributes available within Henkel's broad portfolio of thermal materials.

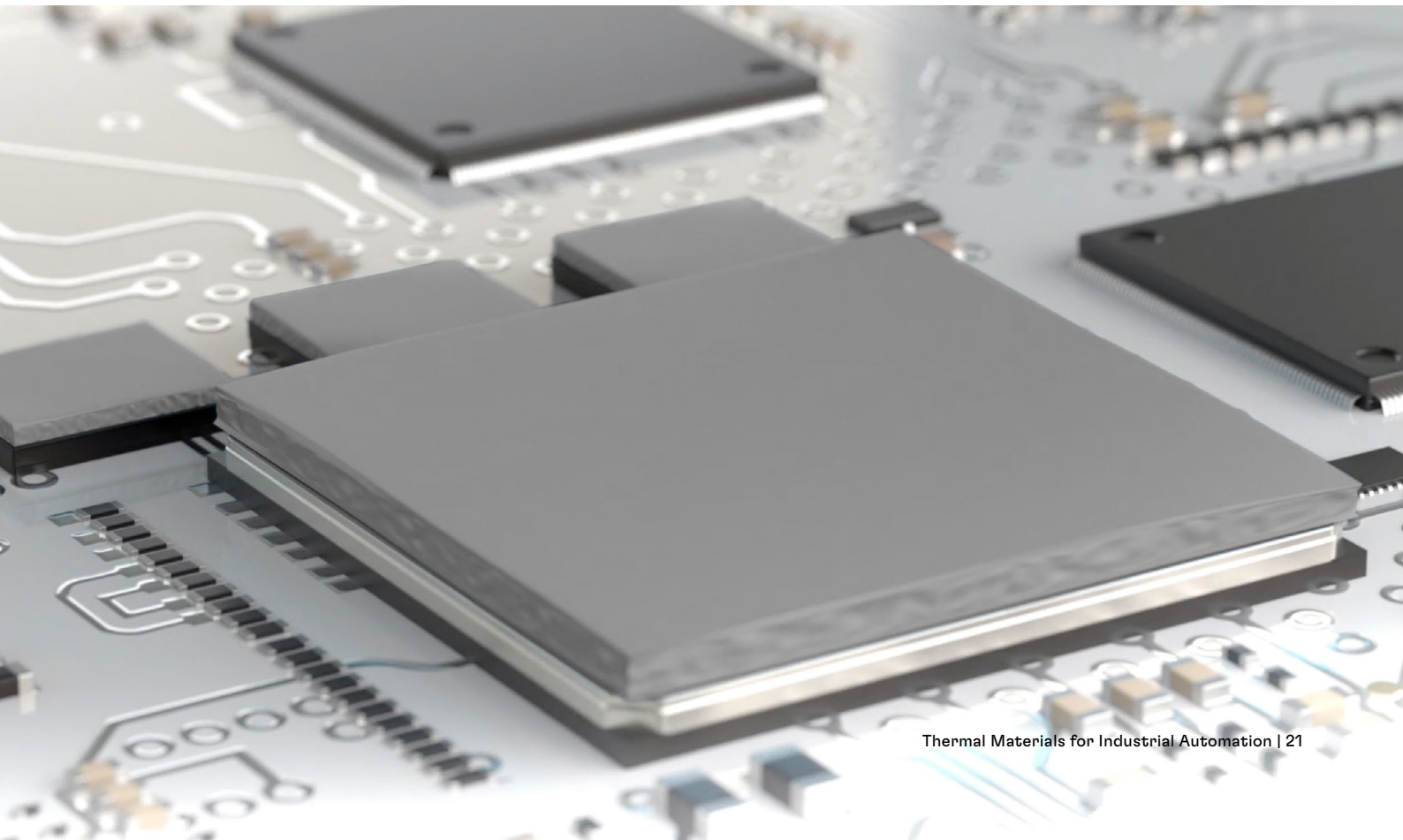
THERMAL MATERIALS FOR INDUSTRIAL AUTOMATION					
BOND-PLY	GAP PAD®	GAP FILLER	ADHESIVES	PHASE CHANGE MATERIAL	SIL PAD®
BERGQUIST® BOND-PLY TBP 1400LMS-HD	BERGQUIST® GAP PAD® TGP 1000VOUS	BERGQUIST® GAP FILLER TGF 1450	BERGQUIST® LIQUI-BOND TLB SA1800	BERGQUIST® HI-FLOW THF 1600P	BERGQUIST® SIL PAD® TSP K900
	BERGQUIST® GAP PAD® TGP 2200SF	BERGQUIST® GAP FILLER TGF 1500LVO	BERGQUIST® LIQUI-BOND TLB SA3500	BERGQUIST® HI-FLOW THF 3000UT	BERGQUIST® SIL PAD® TSP K1100
	BERGQUIST® GAP PAD® TGP 3004SF	BERGQUIST® GAP FILLER TGF 3500LVO	LOCTITE® 315	LOCTITE® TCP 4000 D	BERGQUIST® SIL PAD® TSP K1300
	BERGQUIST® GAP PAD® TGP HC3000	BERGQUIST® GAP FILLER TGF 4000	LOCTITE® 3875	LOCTITE® TCP 7000	BERGQUIST® SIL PAD® TSP 1600S
	BERGQUIST® GAP PAD® TGP HC5000	BERGQUIST® GAP FILLER TGF 4000CVO		LOCTITE® TCP 7800NC	BERGQUIST® SIL PAD® TSP K11750
	BERGQUIST® GAP PAD® TGP 6000ULM	BERGQUIST® GAP FILLER TGF 3000SF			BERGQUIST® SIL PAD® TSP 1800ST
	BERGQUIST® GAP PAD® TGP 7000ULM				BERGQUIST® SIL PAD® TSP Q2500
					BERGQUIST® SIL PAD® TSP 3500

BOND-PLY

Product Name	Description	Thermal Conductivity	Dielectric Breakdown Voltage	Thickness	Recommended Cure	Flame Rating
BERGQUIST® BOND-PLY TBP 1400LMS-HD	Acrylic laminated heat cure adhesive thermal material	1.4 W/mK	4,000 Vac at 0.254 mm	0.254 – 0.457 mm	30 min. at 125°C	UL 94 V-0

GAP PAD®

Product Name	Description	Thermal Conductivity	Modulus	Dielectric Breakdown Voltage	Thickness	Flame Rating
BERGQUIST® GAP PAD® TGP 1000VOUS	Silicone GAP PAD® 1 W/mK	1 W/mK	8 (psi) 55 (kPa)	6,000 Vac	0.508 mm – 6.35 mm	UL 94 V-0
BERGQUIST® GAP PAD® TGP 2200SF	Silicone free GAP PAD® 2 W/mK	2 W/mK	33 (psi) 228 (kPa)	5,000 Vac	0.254 mm – 3.175 mm	UL 94 V-0
BERGQUIST® GAP PAD® TGP 3004SF	Silicone free GAP PAD® 3 W/mK	3 W/mK	–	6,000 Vac	0.254 mm – 3.175 mm	UL 94 V-0
BERGQUIST® GAP PAD® TGP HC3000	High compliance silicone GAP PAD® 3 W/mK	3 W/mK	16 (psi) 110 (kPa)	5,000 Vac	0.508 mm – 3.175 mm	UL 94 V-0
BERGQUIST® GAP PAD® TGP HC5000	High compliance silicone GAP PAD® 5 W/mK	5 W/mK	17.5 (psi) 125 (kPa)	5,000 Vac	0.508 mm – 3.175 mm	UL 94 V-0
BERGQUIST® GAP PAD TGP 6000ULM	Ultra-low modulus silicone GAP PAD® 6 W/mK	6 W/mK	6 (psi) 41.3 (kPa)	5,000 Vac	1.524 mm – 3.175 mm	UL 94 V-0
BERGQUIST® GAP PAD® TGP 7000ULM	Ultra-low modulus silicone GAP PAD® 7 W/mK	7 W/mK	22 (psi) 152 (kPa)	5,000 Vac	1.020 mm – 3.175 mm	UL 94 V-0



GAP FILLER

Product Name	Description	Thermal Conductivity	Viscosity	Dielectric Strength (V/mil)	Cure Schedule	Flame Rating
BERGQUIST® GAP FILLER TGF 1450	Two-part, silicone gap filler 1.5 W/mK	1.5 W/mK	30 (High Shear) at 3000/s 200 (Low Shear) at 1/s	275	5 hr. at 25°C 10 min. at 100°C	UL 94 V-0
BERGQUIST® GAP FILLER TGF 1500LVO	Two-part, silicone, low volatility gap filler 1.8 W/mK	1.8 W/mK	20 (High Shear) at 300/s	400	8 hr. at 25°C 10 min. at 100°C	UL 94 V-0
BERGQUIST® GAP FILLER TGF 3500LVO	Two-part, silicone, low volatility gap filler 3.5 W/mK	3.5 W /mk	45 (High Shear) at 1500/s	275	24 hr. at 25°C 30 min. at 100°C	UL 94 V-0
BERGQUIST® GAP FILLER TGF 4000	Two-part, silicone gap filler 4.0 W/mK	4.0 W /mk	50 (High Shear) at 1500/s	450	24 hr. at 25°C 30 min. at 100°C	UL 94 V-0
BERGQUIST® GAP FILLER TGF 4500CVO	Two-part, high performance, thermally conductive, liquid gap filling material	4.5	20,000	–	48 hr. at 25°C	UL 94 V-0
BERGQUIST® GAP FILLER TGF 3000SF	Two-part room temperature curable gap filler suitable for use in high throughput assembly applications	3.0	22,000	–	72 hr. at 25°C 3 hr. at 85°C	UL 94 V-0

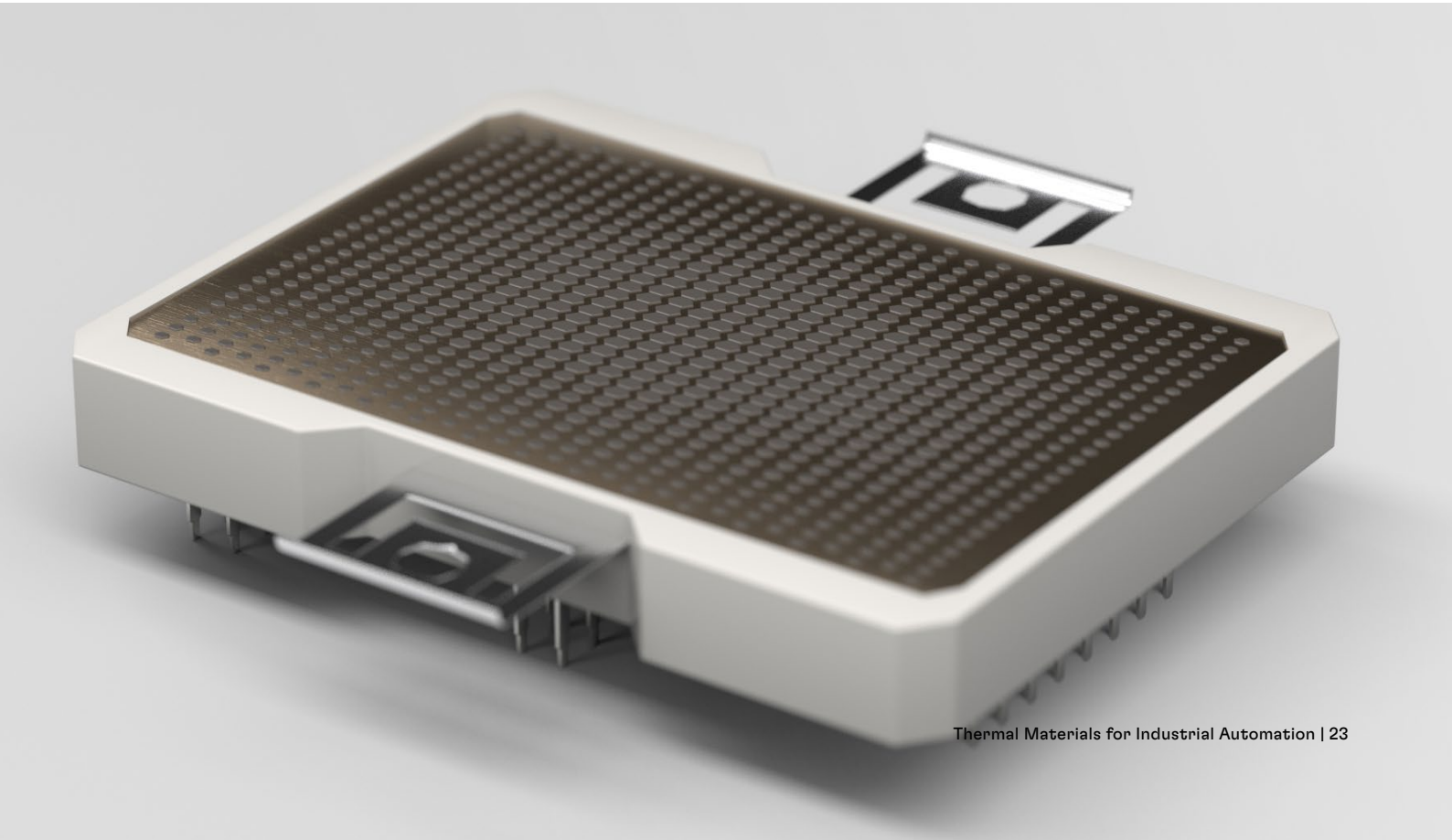
ADHESIVES

Product Name	Description	Thermal Conductivity	Viscosity	Dielectric Strength	Cure Schedule	Flame Rating
BERGQUIST® LIQUI-BOND TLB SA1800	Two-part, liquid silicone adhesive at 3.5 W/mK	3.50 W/mK	45 (part A) / 30 (part B) High shear at 600/s	250 V/mil	20 min. at 125°C	UL 94 V-0
BERGQUIST® LIQUI-BOND TLB SA3500	One-part, liquid silicone adhesive at 1.8 W/mK	1.80 W/mK	125 Pa.s	250 V/mil	20 min. at 125°C	UL 94 V-0
LOCTITE® 315	One-part, liquid acrylic adhesive	0.80 W/mK	360 – 850 Pa.s (Brookfield)	26.7 kV/mm	Various: Activator 7387™ is required for proper curing	UL 94 V-0
LOCTITE® 3875	Two-part, liquid acrylate adhesive	1.75 W/mK	Part A at speed 2.5 rpm, 65 Pa.s Part A at speed 20 rpm, 32 Pa.s Part B at speed 2.5 rpm, 190 Pa.s Part B at speed 20 rpm, 90 Pa.s	–	24 – 72 hr. at 25°C	UL 94 V-0

PHASE CHANGE

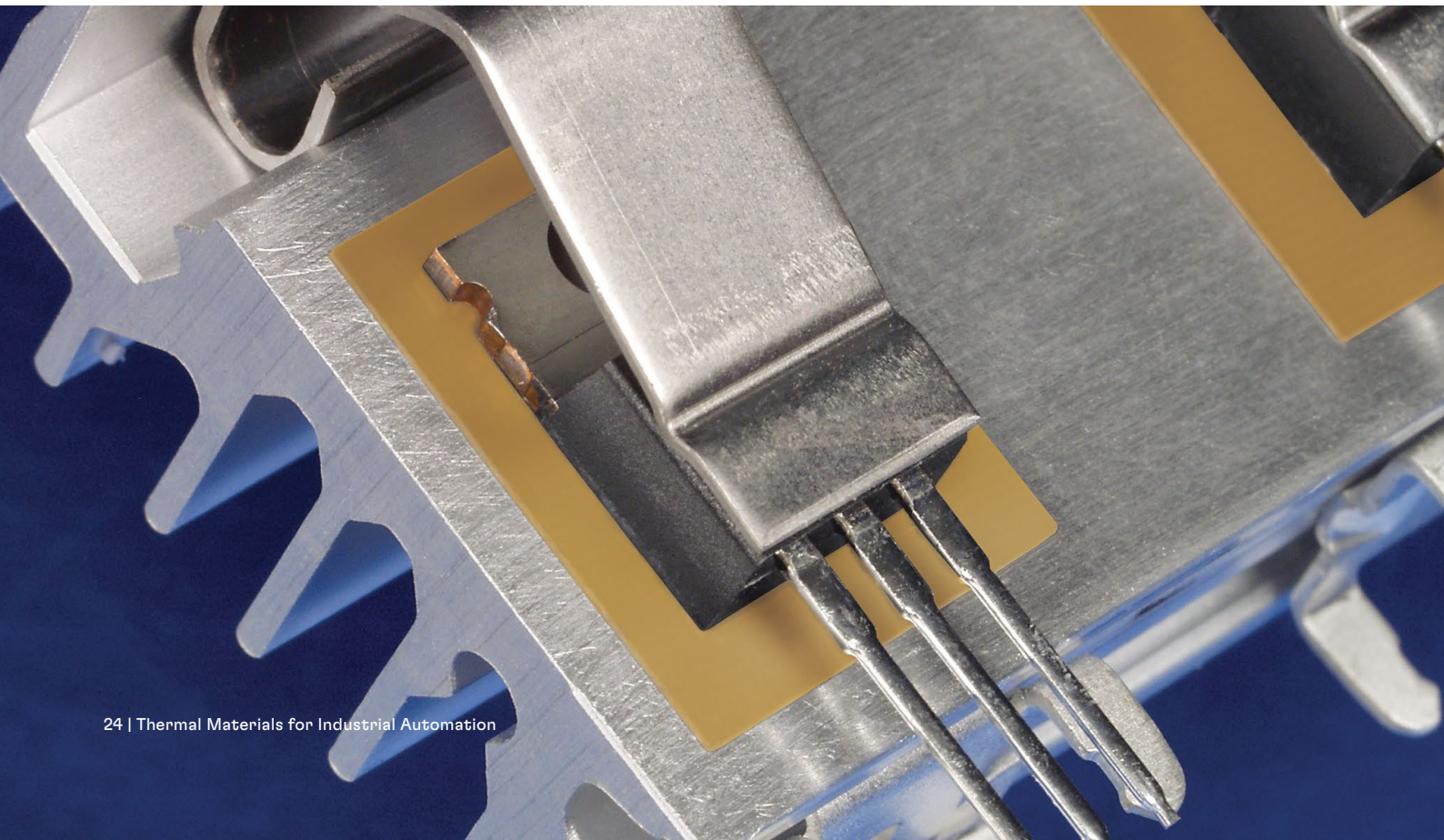
Product Name	Description	Thermal resistance	Volume resistivity	Dielectric Breakdown Voltage	Thickness	Phase Change Temperature	Recommended Drying
BERGQUIST® HI-FLOW THF 1600P	Polyimide film based PCM	0.13°C in^2/W 0.010 at 10 psi	10^{12} (Ω·m)	5,000 Vac	0.004 – 0.005	55°C	–
BERGQUIST® HI-FLOW THF 3000UT	PCM tabulated pad form	0.09°C in^2/W 0.005 at 10 psi	–	–	0.005", 0.01", 0.016"	52°C	–

Product Name	Description	Phase Change Temperature (°C)	Thermal Conductivity	Specific Gravity	Recommended Drying Condition	Application Method
LOCTITE® TCP 4000 D	A reworkable, repeatable and dispensable phase change thermal interface material suitable for use between a heat sink and a variety of heat dissipating components	45	3.4	2	0.051 mm Thickness: 5 hr. at 22°C	Stencil, needle dispensed, screen print or manually apply
LOCTITE® TCP 7000	Non-silicone and reworkable phase change material	45	>3.0	2	0.051 mm Thickness: 30 hr. at 22°C 22 min. at 60°C 3 min. at 125°C	Stencil or screen print
LOCTITE® TCP 7800NC	Non-silicone and reworkable phase change material designed for use between heat generating devices and the surfaces to which they are mounted or other heat dissipating surfaces	45	>3.0	2	0.051 mm Thickness: 30 hr. at 22°C 22 min. at 60°C 3 min. at 125°C	Stencil, screen print or manual application



SIL-PAD®

Product Name	Description	Thermal Conductivity	Viscosity	Dielectric Strength (V/mil)	Cure Schedule	Flame Rating
BERGQUIST® SIL-PAD® TSP K1300	Polyimide reinforced SIL-PAD®	1.3 W/mK	90	6,000 Vac	0.15 ± 0.025	UL 94 V-0
BERGQUIST® SIL-PAD® TSP K1100	Polyimide reinforced SIL-PAD®	1.1 W/mK	90	6,000 Vac	0.15 ± 0.025	UL 94 V-0
BERGQUIST® SIL-PAD® TSP K900	Polyimide reinforced SIL-PAD®	0.9 W/mK	90	6,000 Vac	0.15 ± 0.025	UL 94 V-0
BERGQUIST® SIL-PAD® TSP 3500	Fiberglass reinforced SIL-PAD®	3.5 W/mK	90	4,000 Vac	0.254 – 0.508	UL 94 V-0
BERGQUIST® SIL-PAD® TSP 1800ST	Fiberglass reinforced SIL-PAD®	1.8 W/mK	75	3,000 Vac	0.203	UL 94 V-0
BERGQUIST® SIL-PAD® TSP 1600S	Fiberglass reinforced SIL-PAD®	1.6 W/mK	92	5,500 Vac	0.229	UL 94 V-0
BERGQUIST® SIL-PAD® TSP 1750	Fiberglass reinforced SIL-PAD®	1.7 W/mK	85	6,000 Vac	0.250	UL 94 V-0
BERGQUIST® SIL-PAD® TSP Q2500	Aluminum reinforced SIL-PAD	2.5 W/mK	93	Non-insulating	0.152	UL 94 V-0



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