LOCTITE®
TECHNOMELT®

BERGQUIST®

PROTECTIVE AND INNOVATIVE MATERIALS FOR

NEXT-GENERATION INDUSTRIAL AUTOMATION

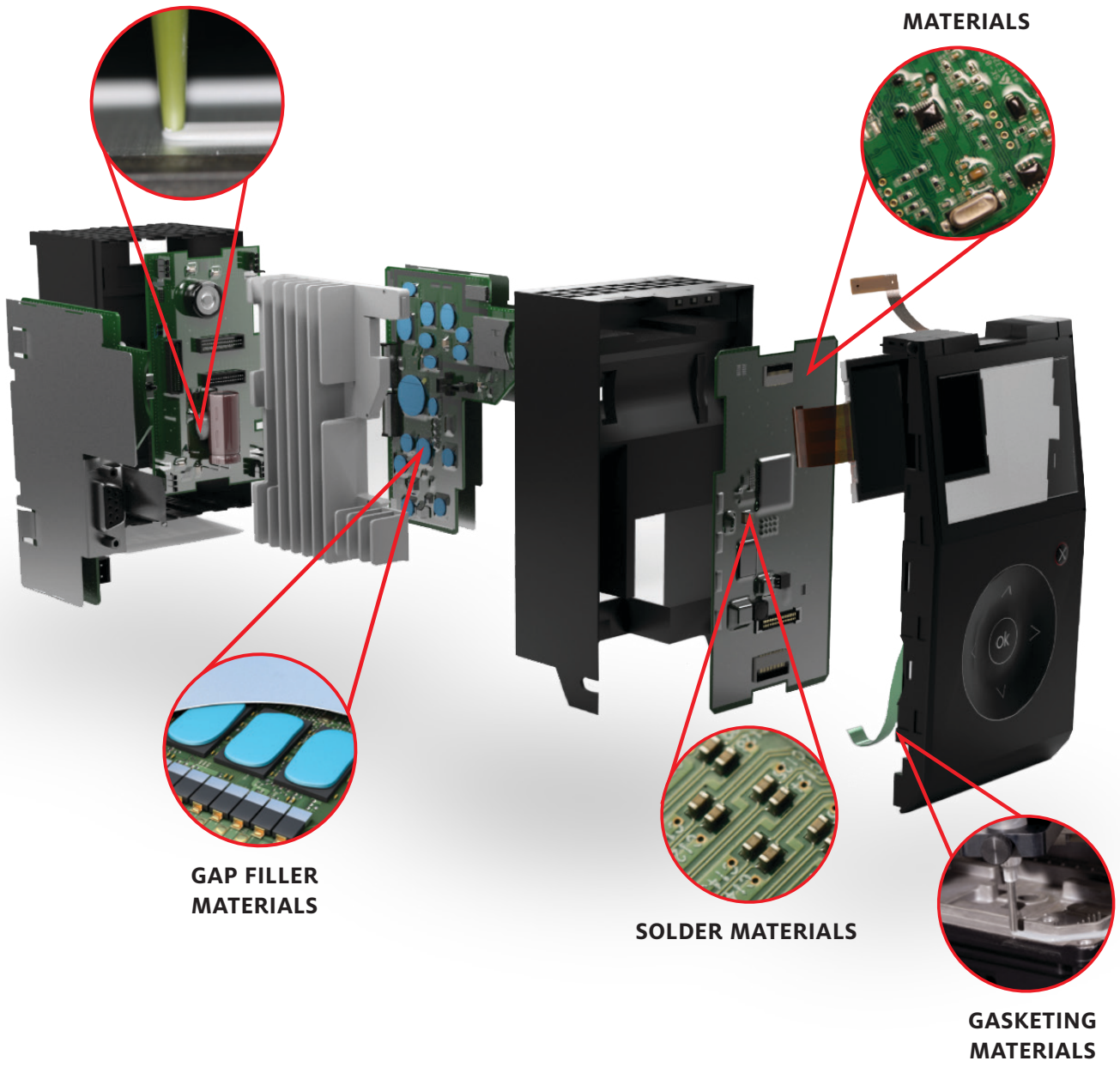
CONTENTS

DRIVING AND CONTROLLING INDUSTRY 4.0 AND BEYOND

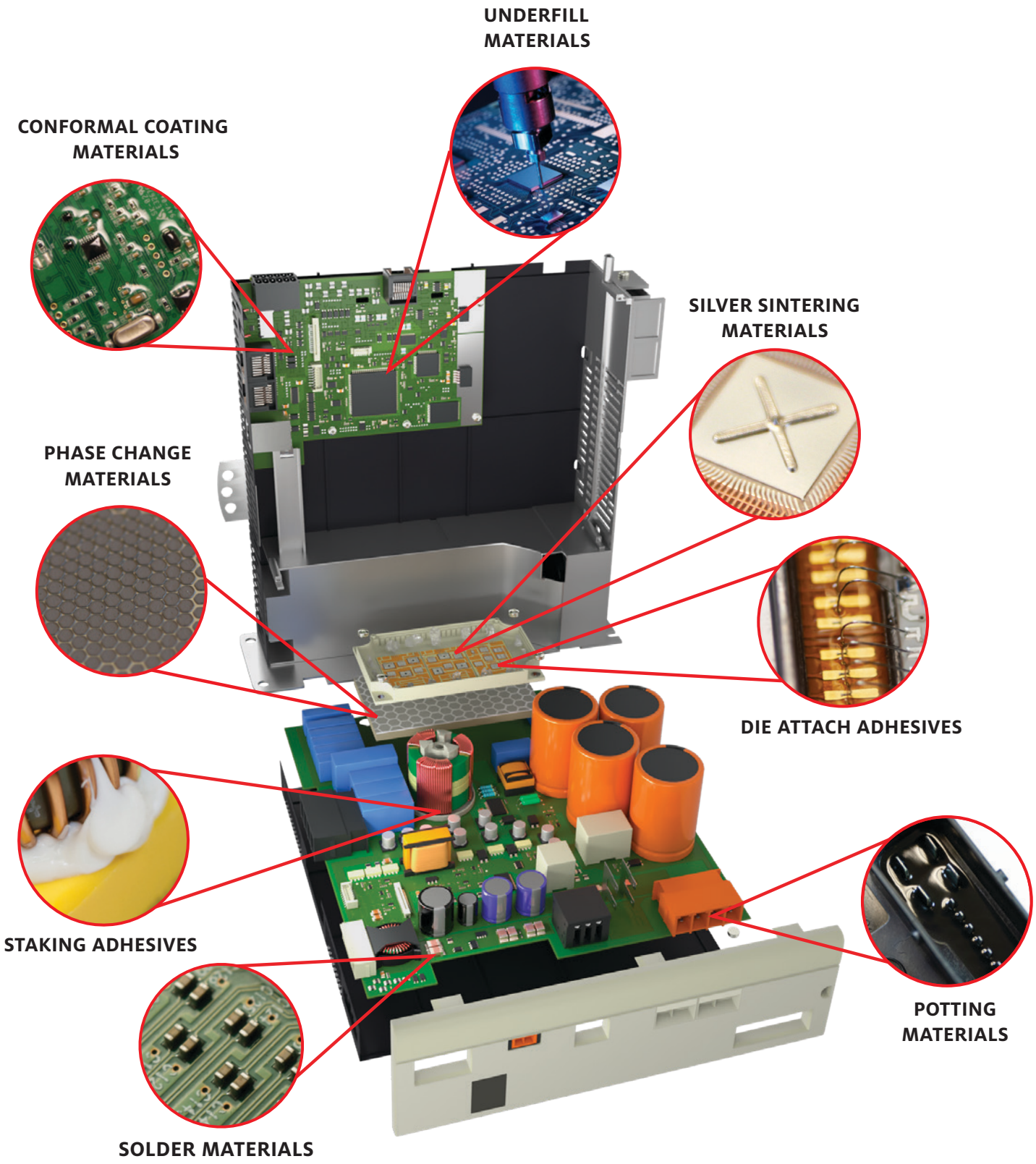
Today's motor drives and industrial controls are undergoing significant transformation as manufacturing moves from conventional linear operation to a connected, integrated Industry 4.0 ecosystem. The Smart Factory environment dictates precise control, real-time communication functionality and actionable 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.

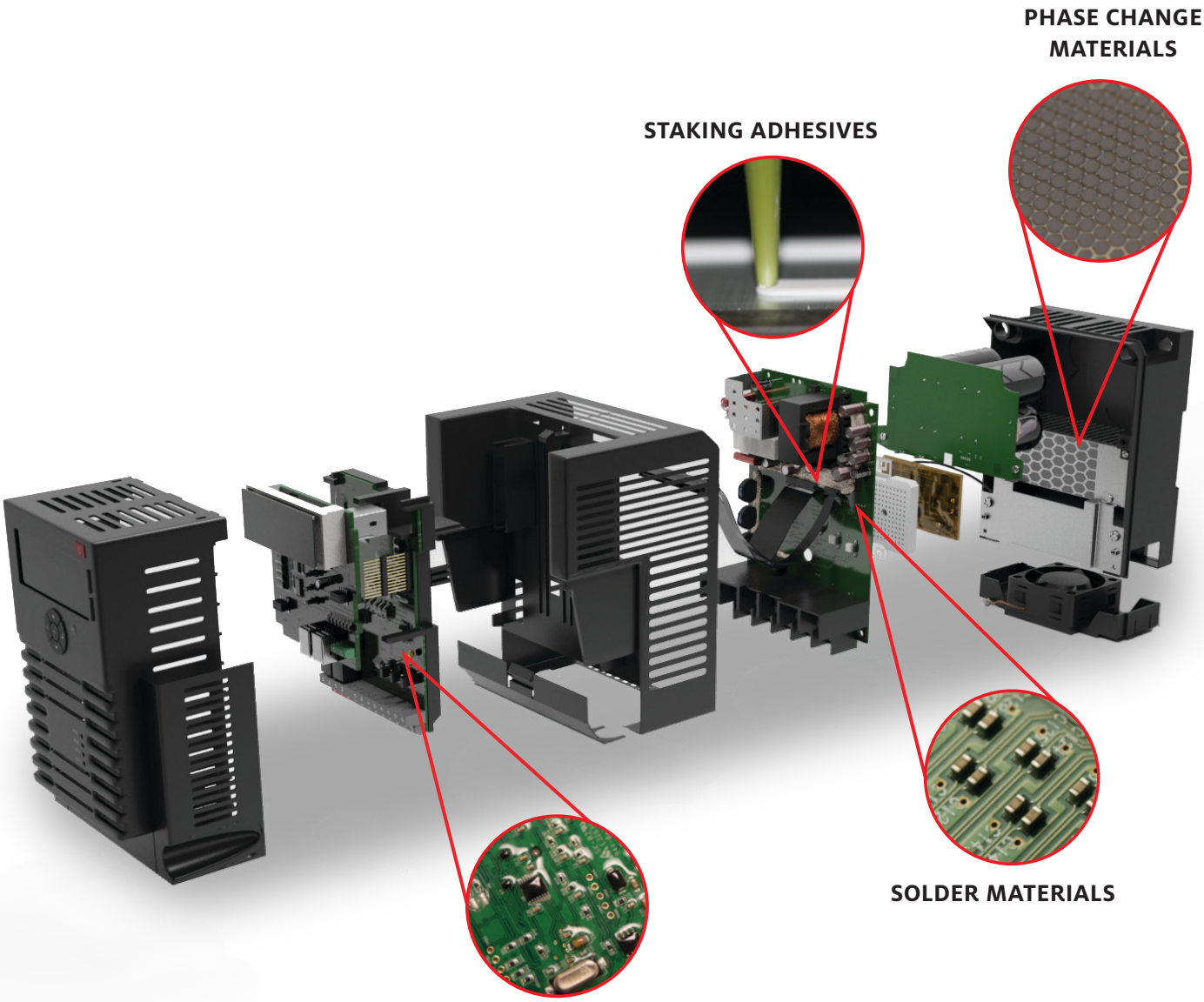
MATERIAL SOLUTIONS FOR PROGRAMMABLE LOGIC CONTROLLER (PLC)



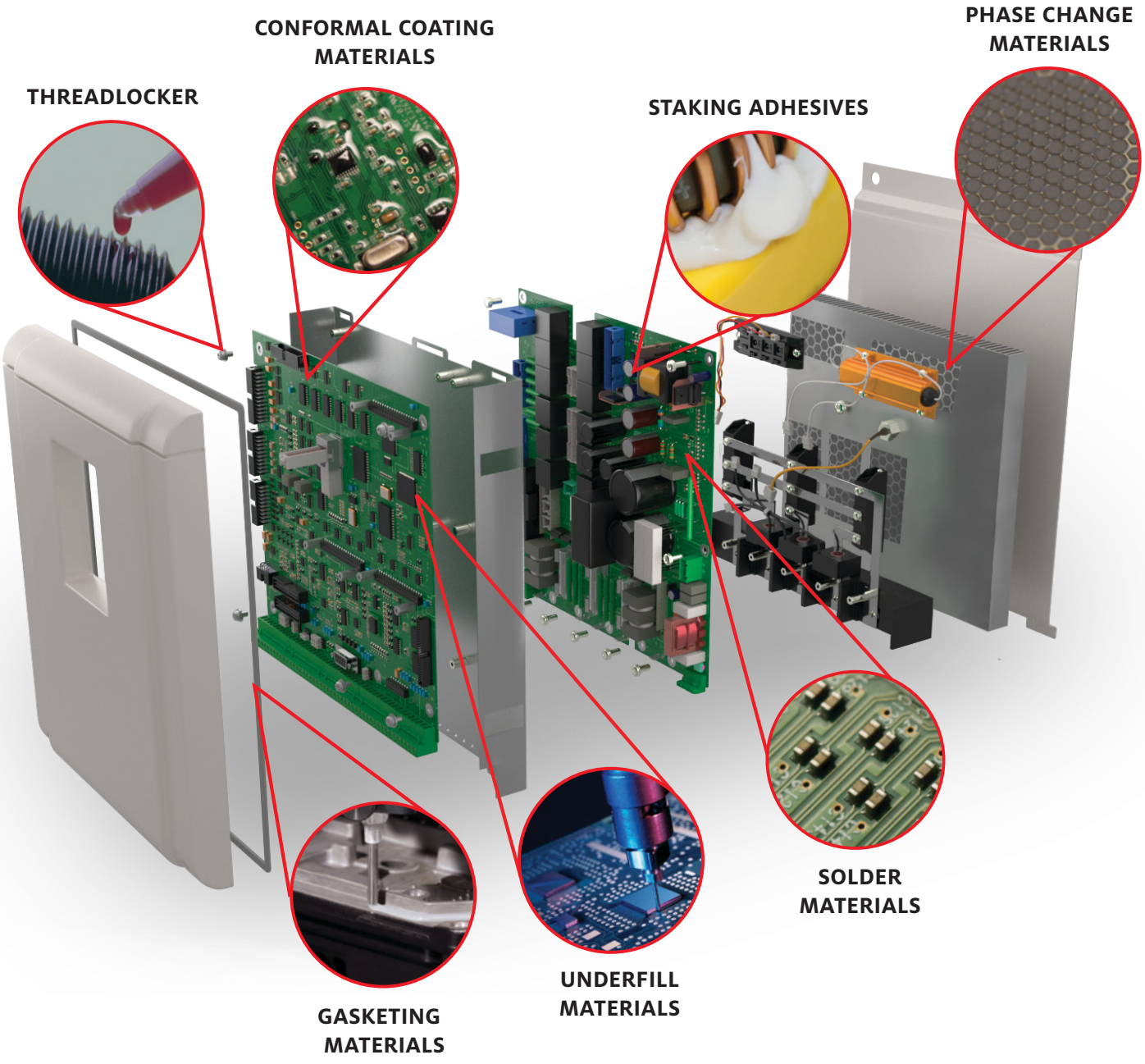
MATERIAL SOLUTIONS FOR SERVO DRIVE



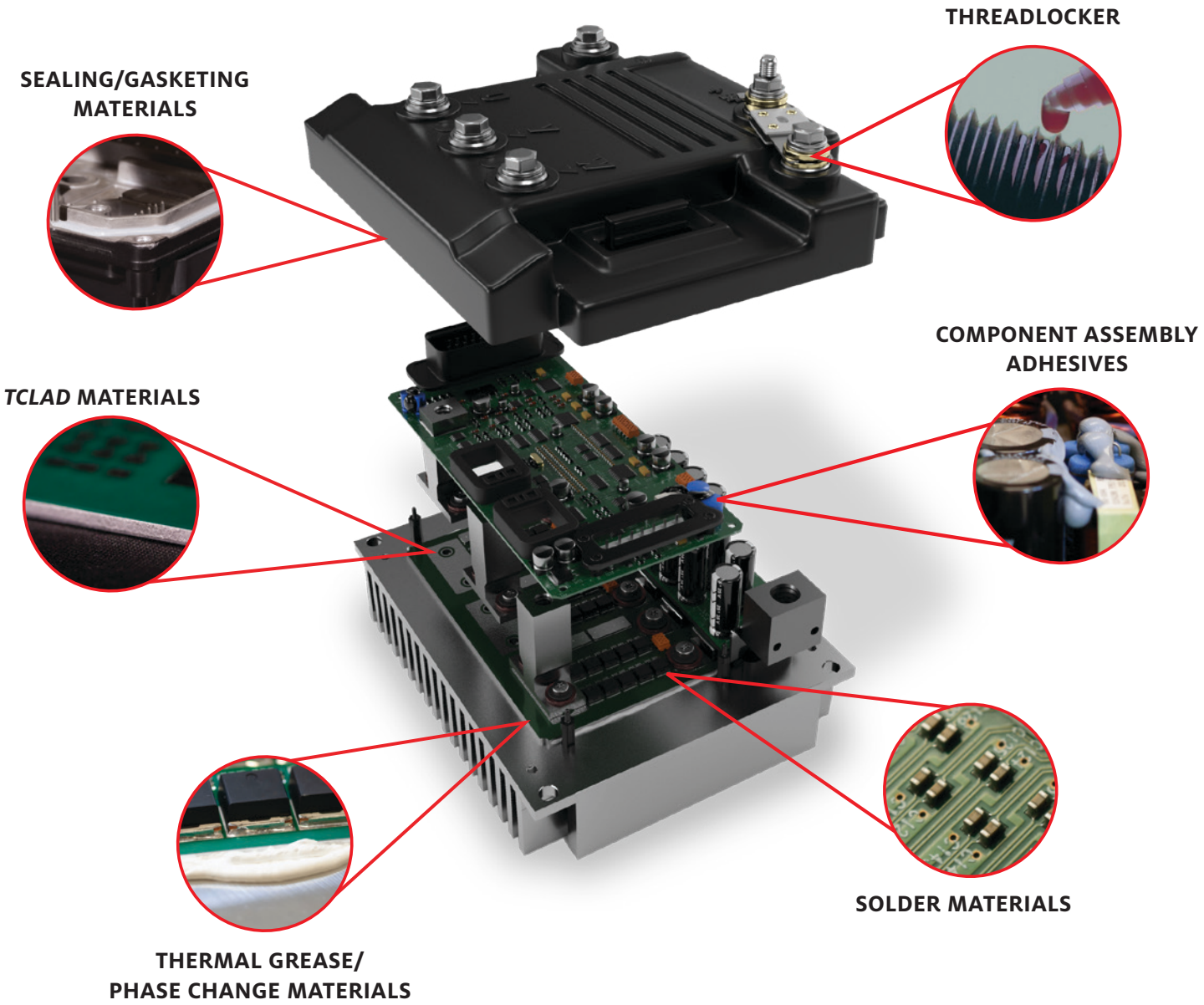
MATERIAL SOLUTIONS FOR VARIABLE-FREQUENCY DRIVE (VFD)



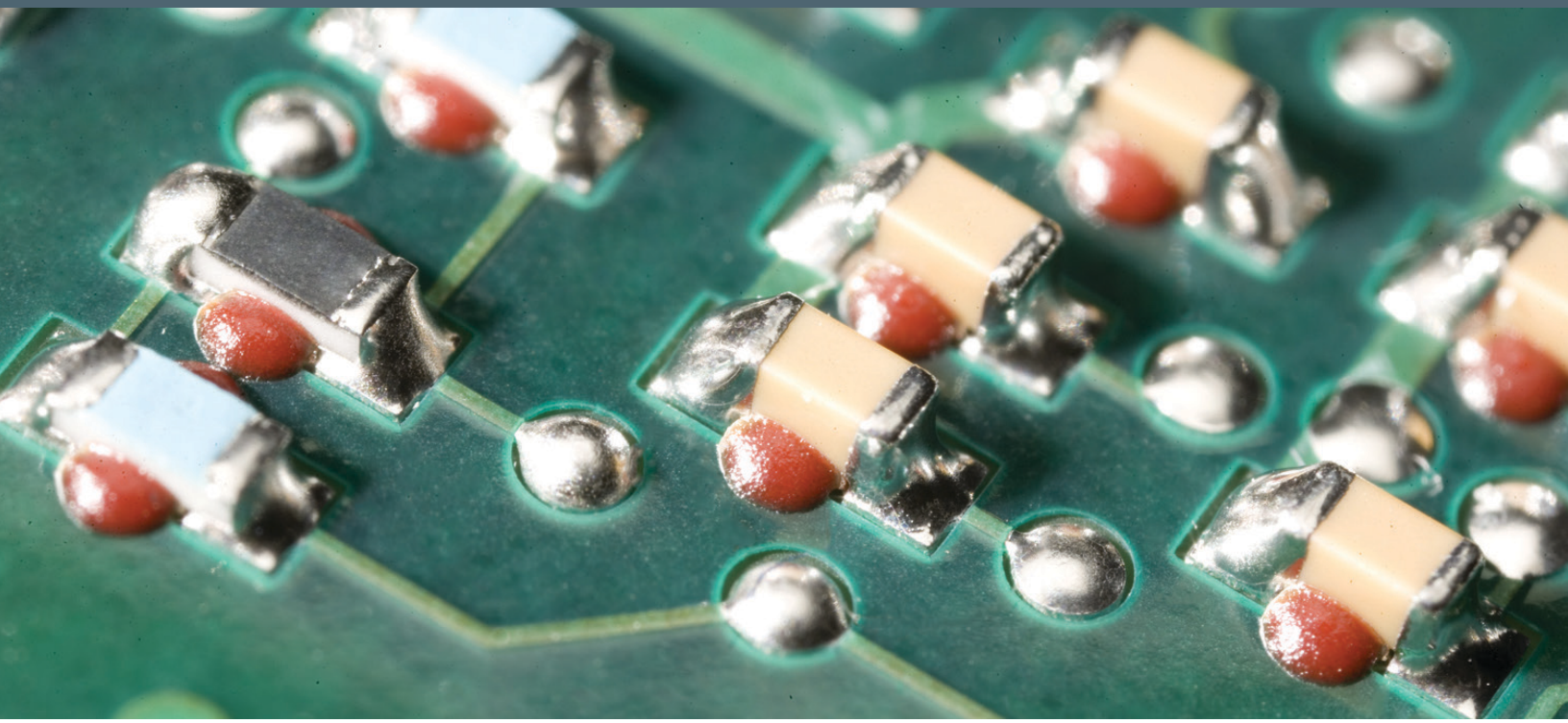
MATERIAL SOLUTIONS FOR DC DRIVE



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**	**ACRYLIC**	LOCTITE® AA 3103			
		EPOXY	*LOCTITE ABLESTIK* 2151	*LOCTITE ABLESTIK* 2332	*LOCTITE ABLESTIK* 3128	*LOCTITE ABLESTIK* G 500
	CHIPBONDER	**EPOXY**	*LOCTITE* 3609	*LOCTITE* 3616	*LOCTITE* 3627	
	DIE ATTACH ADHESIVES	**EPOXY**	*LOCTITE ABLESTIK* 84-3	*LOCTITE ABLESTIK* 8700K	*LOCTITE ABLESTIK* 8900NC	*LOCTITE ABLESTIK* ABP 8064T
			LOCTITE ABLESTIK ABP 8068TB	*LOCTITE ABLESTIK* SP 2020	*LOCTITE ABLESTIK* QMI529HT	*LOCTITE ABLESTIK* QMI529HT-LV
	THREADLOCKER	**ACRYLIC**	*LOCTITE* 243	*LOCTITE* 248		

ASSEMBLY ADHESIVES

Product Name	Description	Chemistry	Viscosity (cP)	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	Acrylic	11,250	–	Assembly Adhesive	50 mW/cm² 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	Epoxy	40,000	2.10×10^{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.	Epoxy	75,000	6.00×10^{14}	Assembly Adhesive	1 hr. at 120°C

CHIPBONDER

Product Name	Description	Chemistry	Viscosity (cP)	Glass Transition Temperature, T_g (°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.	Epoxy	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.	Epoxy	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.	Epoxy	3,500 (Casson)	105	2 min. at 150°C

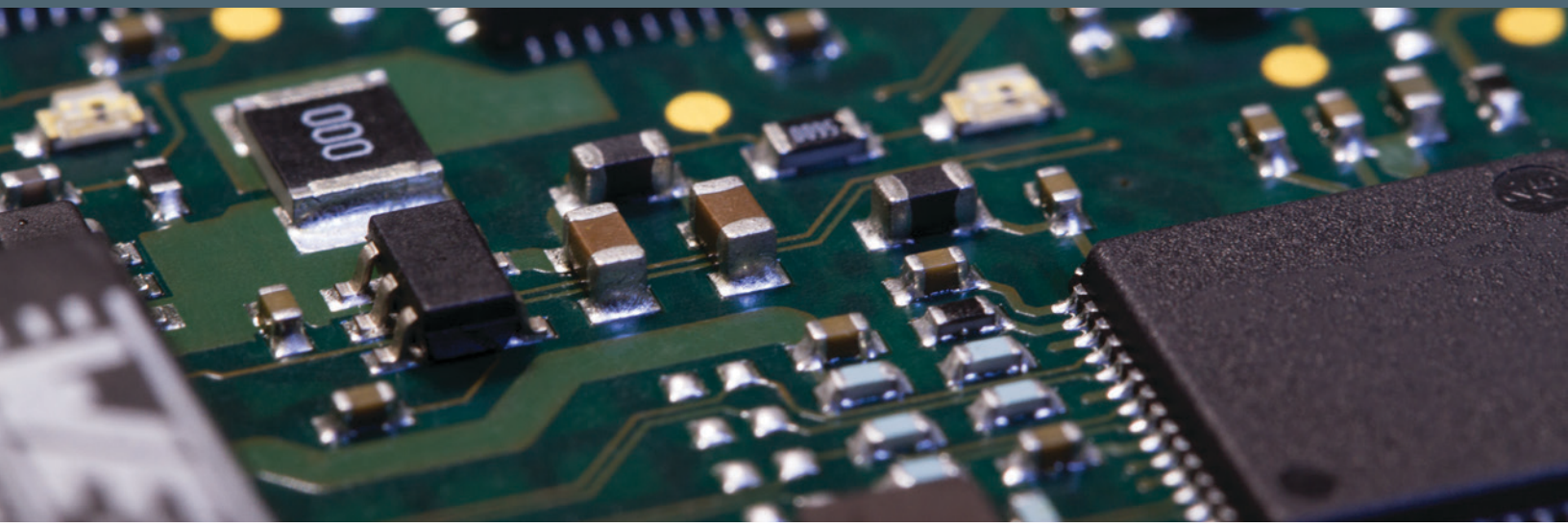
DIE ATTACH ADHESIVES

Product Name	Description	Chemistry	Viscosity (cP)	Work Life at 25°C	Coefficient of Thermal Expansion, CTE (ppm/°C) Above T_g	Cure Schedule
LOCTITE ABLESTIK 84-3	Designed for medium die attach applications. This adhesive is ideal for application by automatic dispensing, screen printing or hand.	Epoxy	50,000	14 Days	100	1 hr. at 150°C
LOCTITE ABLESTIK 8700K	Provides excellent adhesion to thin film and thick film gold surfaces. This adhesive retains its dispensed height after cure, without slumping.	Epoxy	45,000	30 Days	55	1 hr. at 175°C
LOCTITE ABLESTIK 8900NC	Snap curable, high throughput die attach paste. Use for small to medium package sizes bonding care copper, Ag plated Cu lead frames and Pd plated Cu lead frames.	Epoxy	10,000	24 Hours	162	30 min. ramp to 175°C + 15 min. at 175°C
LOCTITE ABLESTIK ABP 8064T	Highly filled, conductive die attach adhesive designed to provide high thermal and electrical conductivity in the attachment of integrated circuits and components onto metallic lead frames	Hybrid Chemistry	12,000	24 Hours	136	60 min. ramp from 25°C – 180°C, hold 60 min. at 180°C in N_2 oven
LOCTITE ABLESTIK ABP 8068TB	Silver-filled semi-sintering die attach adhesive designed for semiconductor packages with high thermal and electrical requirements. It is formulated with a more enhanced resin bleed control than its predecessor *LOCTITE ABLESTIK* ABP 8068TA.	Semi-Sintering	11,500	16 Hours	103	For die size < 5 x 5 mm: 20 min. ramp from 25°C – 130°C, hold for 30 – 60 min. ; 15 min. ramp to 200°C, hold for 120 min. in N_2 or air oven
LOCTITE ABLESTIK SP 2020	Sintering silver paste die attach adhesive designed for devices requiring high thermal and electrical conductivity; formulated to provide high heat transfer generated from power devices	Silver Sintering Paste	19,000	> 18 Hours	–	N_2 oven: 10 min. ramp to 250°C + 60 min. at 250°C
LOCTITE ABLESTIK QMI529HT	Soft-solder replacement or for high UPH performance applications. Maximum productivity is realized through in-line cure, either on the die bonder using a post die bond heater or on the wirebonder preheater.	Acrylate	18,500	24 Hours	156	60 sec. at 185°C snap cure or 30 min. at 185°C
LOCTITE ABLESTIK QMI529HT-LV	Conductive die attach adhesive has been formulated for use in high throughput die attach applications	BMI Hybrid	16,000	24 Hours	162	30 min. ramp to 175°C + 1 hr. at 175°C

THREADLOCKER

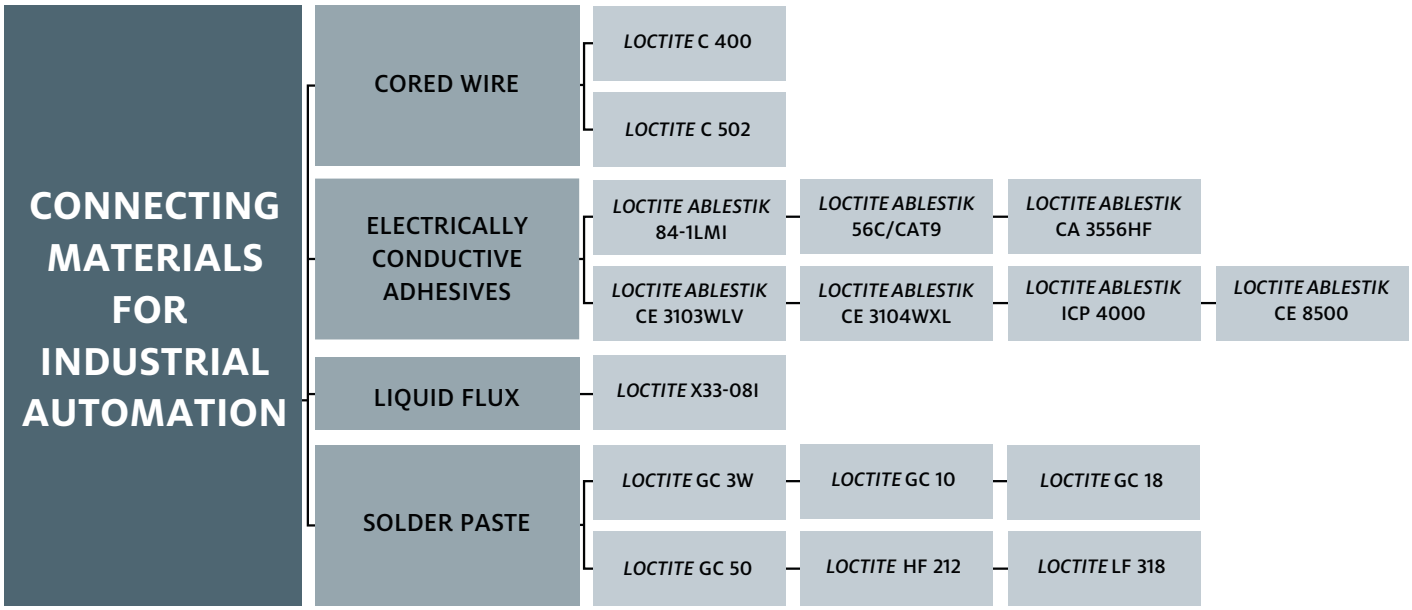
Product Name	Description	Chemistry	Color	Cure Speed	Viscosity at 25°C (cP)
Acrylic					
LOCTITE® 243	General purpose threadlocker of medium bond strength. This threadlocker secures and seal bolts, nuts and studs to prevent loosening due to vibration.	Acrylic	Blue	24 hr.	1,300 – 3,000
LOCTITE 248	Medium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

CONNECTING MATERIALS FOR INDUSTRIAL AUTOMATION



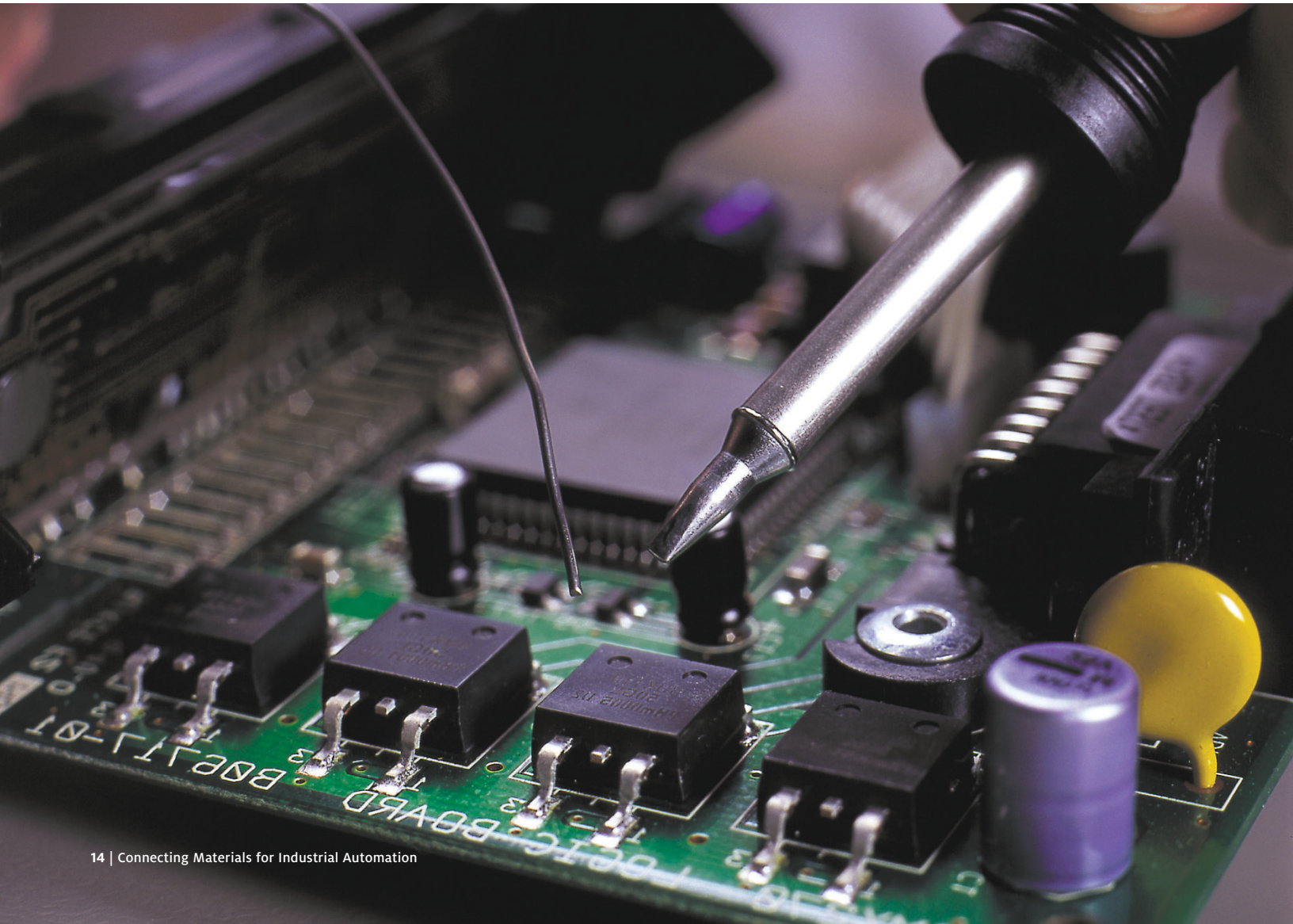
CONNECTING MATERIALS

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. Solder materials and 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.



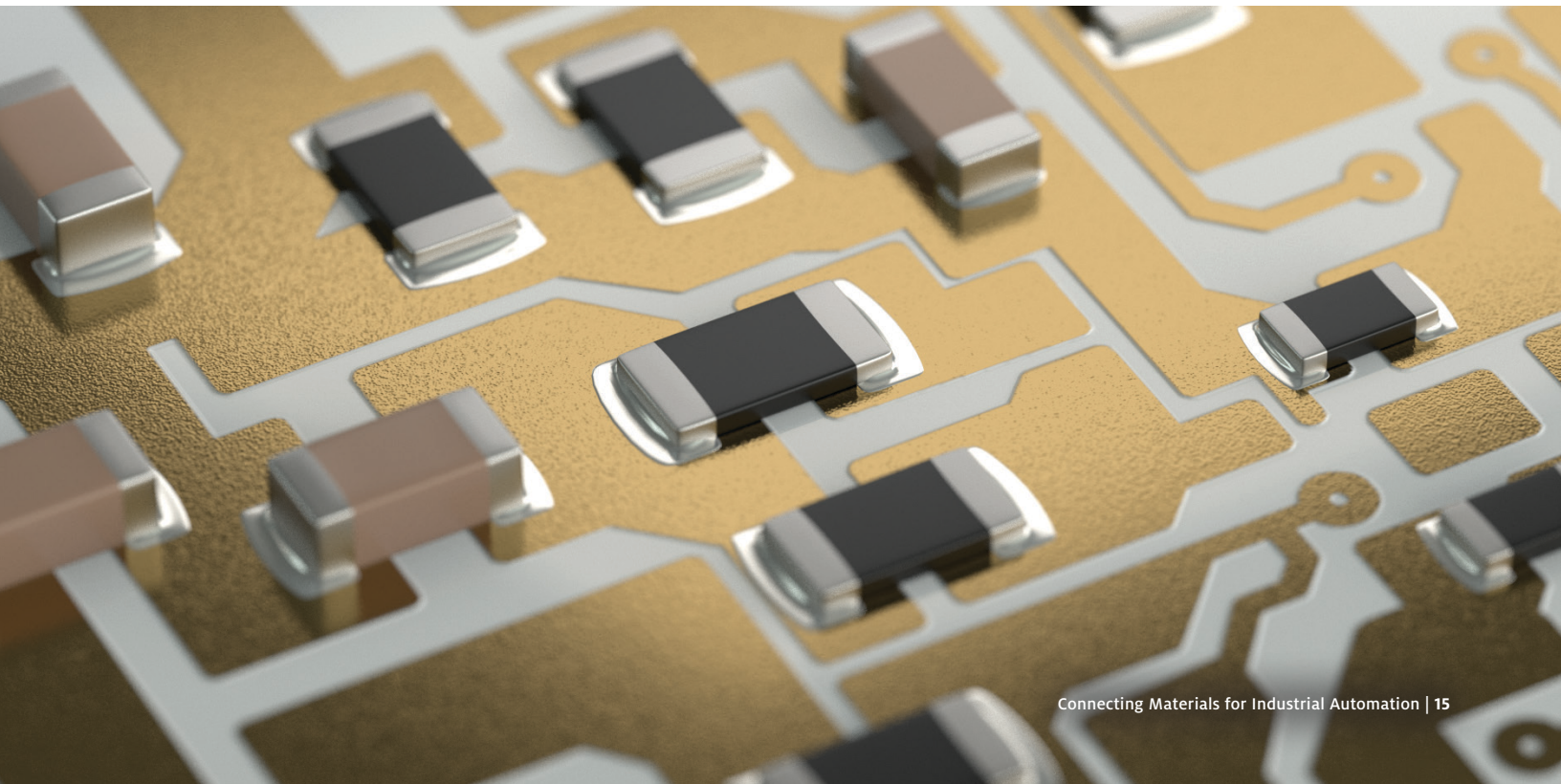
CORED WIRE

Product Name	Description	Solid Content	Acid Value (mg KOH/kg)	IPC J-STD-004B Classification	Halide Content	Alloy	Diameter Range (mm)
LOCTITE® C 400	Halogen-free, no-clean cored solder wire	2.2%	205 – 220	ROL0	0.0%	Sn63, Sn60 Sn62 SAC305 SAC387 SnCu SnSb SnAg	0.38 – 1.63
LOCTITE C 502	Halide-containing, no-clean cored solder wire	2.7%	156 – 172	ROM1	0.2%	Sn63 Sn60 Sn62 SAC305 SAC387 SnCu SnSb SnAg	0.25 – 1.63



ELECTRICALLY CONDUCTIVE ADHESIVES

Product Name	Description	Technology	Viscosity at 25°C (cP)	Modulus at 25°C (MPa)	Volume Resistivity (Ω•cm)	Cure Schedule
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	Epoxy	–	–	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.	Acrylate	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	Epoxy	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.	Epoxy	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.	Silicone	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.	Epoxy	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	Modified Epoxy	120,000 – 140,000	–	3.5×10^{13}	1 hr. at 150°C

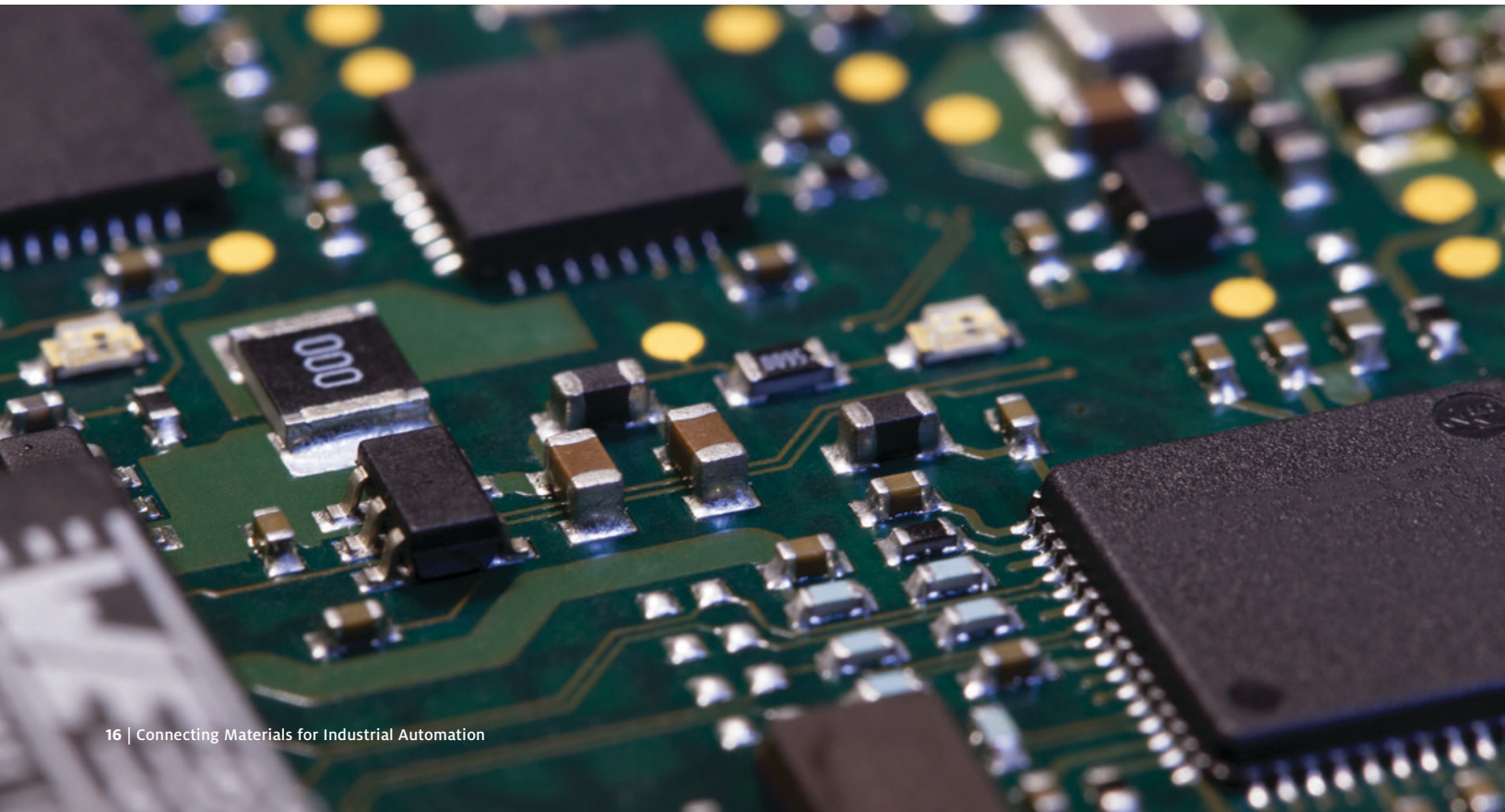


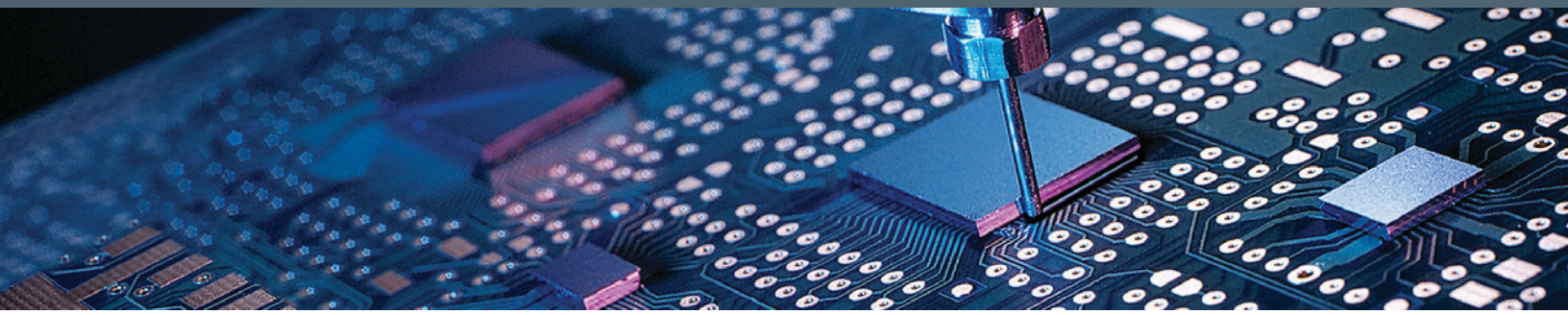
LIQUID FLUX

Product Name	Description	Solids	Acid Value (mg KOH/kg)	Application	IPC J-STE-004B Classification
LOCTITE® X33-08i	Resin-free, no-clean, halide-free liquid flux for surfaces with poor solderability	1.6%	17.5	Foam, Spray or Wave Fluxers	ORL0

SOLDER PASTE

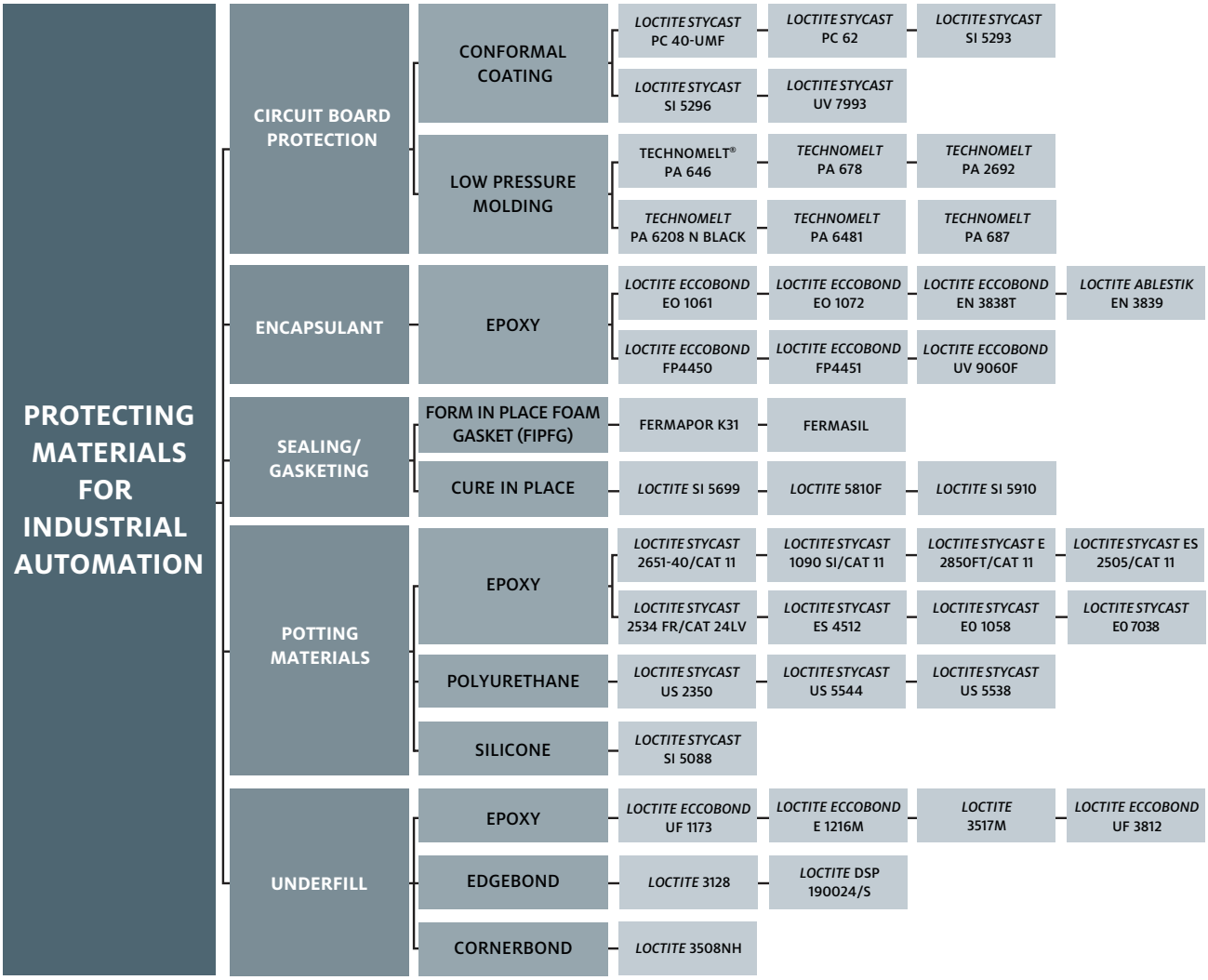
Product Name	Description	Alloy	Particle Size Distribution	IPC J-STE-004B Classification	Shelf Life	Reflow Atmosphere
LOCTITE GC 3W	Pb-free, water washable, halogen-free, temperature stable solder paste	SAC305	Type 3, 4	ORM0	6 months up to 26.5°C	Air and Nitrogen
LOCTITE GC 10	Pb-free, halogen-free, temperature stable solder paste	SAC305	Type 3, 4, 5	ROL0	12 months up to 26.5°C	Air and Nitrogen
LOCTITE GC 18	2nd generation temperature stable solder paste designed for improved void control especially under QFNs	SAC305	Type 3, 4	ROL0	12 months up to 26.5°C	Air and Nitrogen
LOCTITE GC 50	Pb-free, halogen-free, temperature stable solder paste designed for jet dispensing	SAC305	Type 5	ROL0	12 months up to 26.5°C	Air and Nitrogen
LOCTITE HF 212	Pb-free, no-clean, halogen-free solder paste	SAC305 SAC0307 SAC387 90iSC	Type 3, 4, 4.5 (4A), 5	ROL0	6 months at 0 – 10°C	Air and Nitrogen
LOCTITE LF 318	Pb-free, no-clean, halide-free solder paste	SAC305 SAC387 90iSC	Type 3, 4	ROL0	6 months at 0 – 10°C	Air and Nitrogen





PROTECTING MATERIALS

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.



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 or 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 – 40 sec. at > 70 mW/cm² [UV 365 nm] Tack free: 10 – 24 hr. 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 or 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 or 50 hr. at RT / > 70% RH	120	-40 – 130 °C

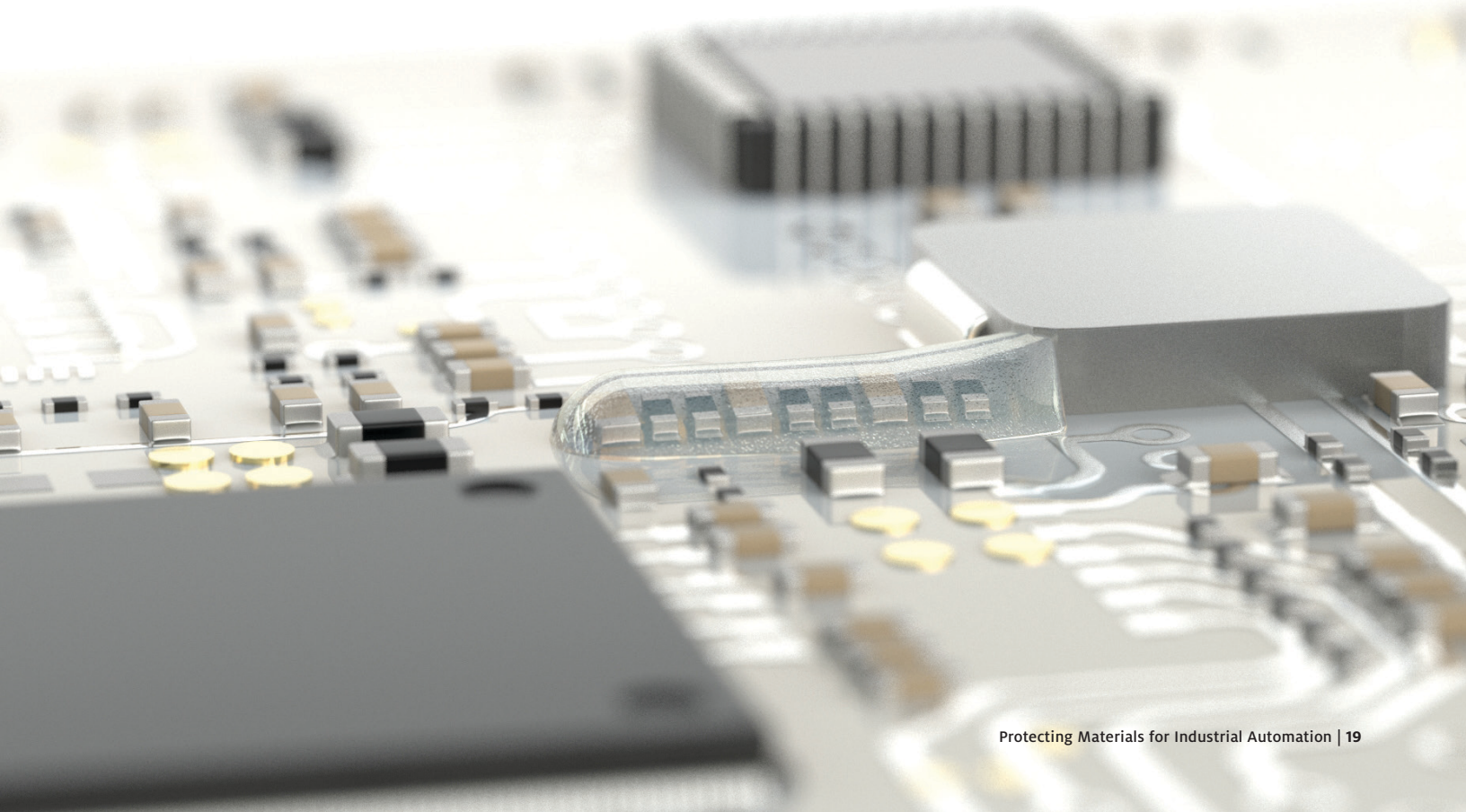
LOW PRESSURE MOLDING

Product Name	Description	Operating Temperature	Shore Hardness	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 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 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

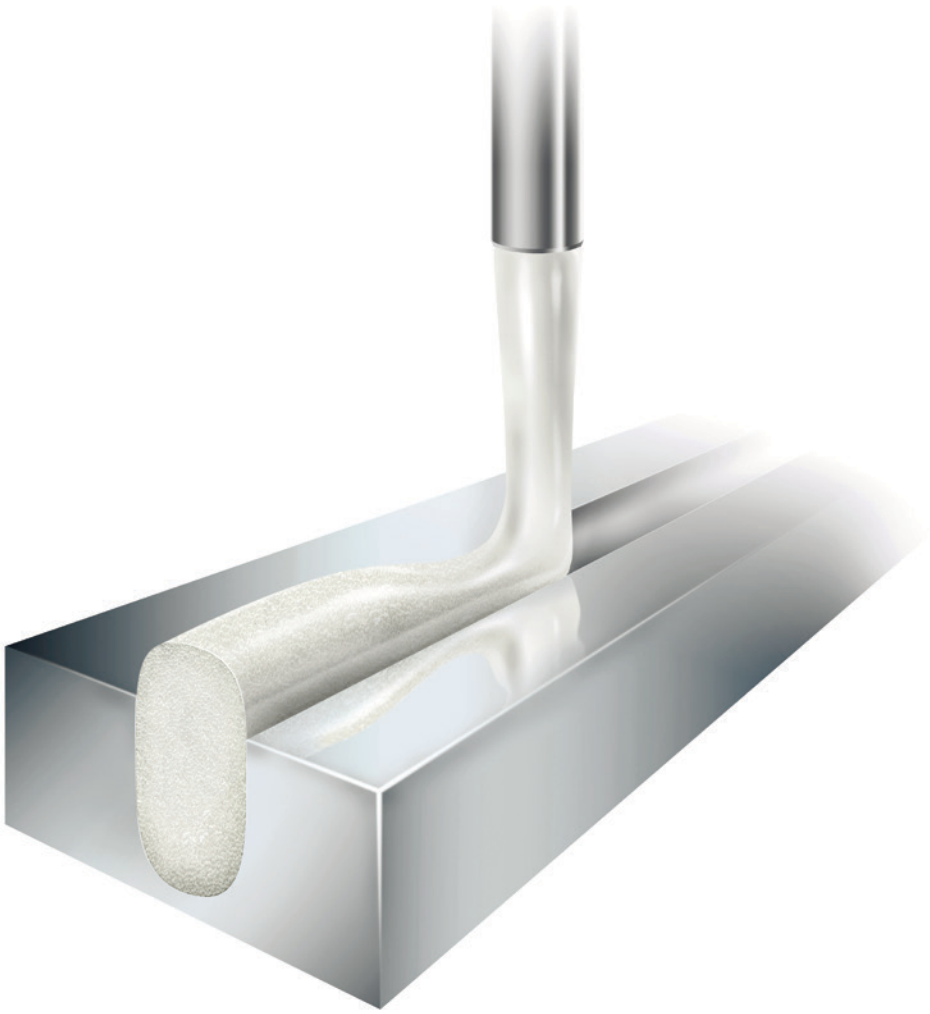
Product Name	Description	Viscosity at 25°C (cP)	Glass Transition Temperature, T_g (°C)	Coefficient of Thermal Expansion, CTE (ppm/°C)		Pot Life at 25°C (Days)	Cure Schedule
				Above T_g	Below T_g		
LOCTITE ECCOBOND EO 1061	Medium glob chip-on-board one-component epoxy encapsulant	50,000	125	–	40	25	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	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	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	2,000 mJ/cm^2 at 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	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	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/cm^2



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°C)	< 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°C)	< 97 % depending on test conditions

Product Name	Description	Chemistry	Viscosity	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	This one-component, silicone sealant has excellent adhesion and can be used to seal electronic components	Oxime Silicone	Paste	≤ 30 min.	RTV



POTTING MATERIALS

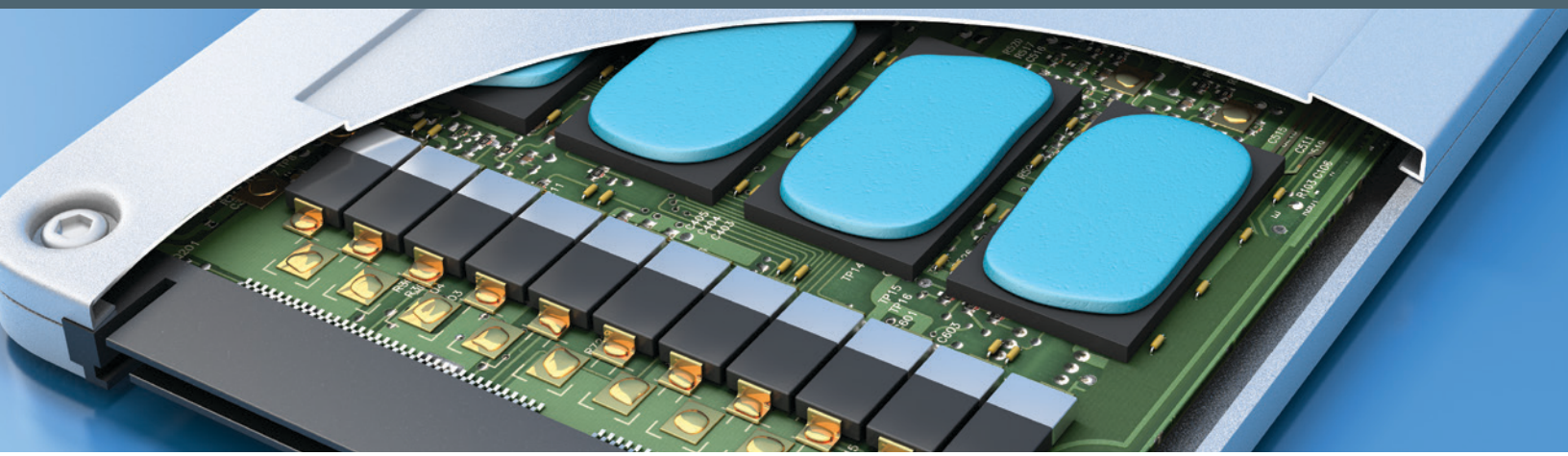
Product Name	Description	Technology	Cure Schedule	Viscosity at 25°C (cP)	Working Life	Shore Hardness	Flammability Rating
Epoxy - Two Part							
LOCTITE STYCAST 2651-40/CAT 11	General purpose epoxy potting material	Epoxy	12 hr. at 80°C or 3 hr. at 100°C or 45 min. at 120°C	4,000	> 4 hr. for 100 g mass at 25°C	88D	–
LOCTITE STYCAST 1090 SI/CAT 11	Lightweight epoxy potting material	Epoxy	8 – 16 hr. at 80°C or 2 – 4 hr. at 100°C or 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	Epoxy	8 – 16 hr. at 80°C or 2 – 4 hr. at 100°C or 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	Epoxy	8 – 16 hr. at 80°C or 2 – 4 hr. at 100°C or 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	Epoxy	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	Epoxy	Gel time: 5 hr. at 25°C Cure: 36 – 48 hr. at 25 °C or 3 hr. at 60°C	19,000	1 hr. for 200 g mass at 25°C	88D	UL 94 V-0

Product Name	Description	Technology	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	Epoxy	Gel time: 12 min. at 121°C Cure: 2 hr. at 140°C or 3 hr. at 125°C	50,000	10 days	90D
LOCTITE STYCAST EO 7038	One-component, heat cured epoxy potting material	Epoxy	3 hr. at 130°C or 2 hr. at 140°C or 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.	Urethane	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.	Urethane	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.	Urethane	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	Silicone	20 sec. at > 30 mW/cm² [UV 365 nm]	50,000 – 80,000	–	25A

UNDERFILL

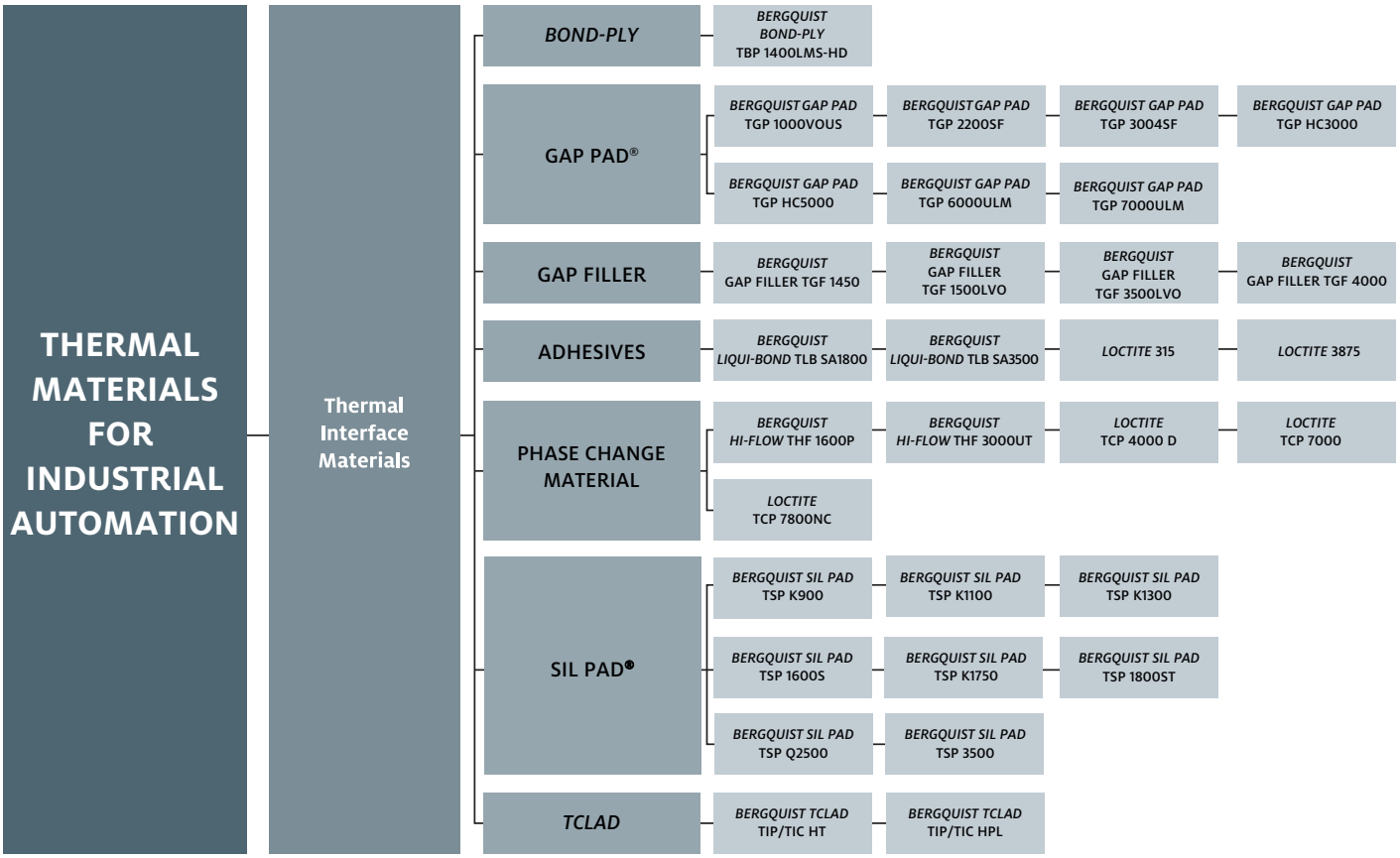
Product Name	Description	Cure Schedule	Viscosity at 25°C (cP)	Coefficient of Thermal Expansion, CTE (ppm/°C)		Glass Transition Temperature, T_g (°C)	Pot Life (days)
				Above T_g	Below T_g		
Epoxy							
LOCTITE® *ECCOBOND* UF 1173	Designed to provide a uniform and void-free encapsulant underfill, maximizing 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	Intensity: 30 mW/cm² Wavelength: 365 nm Time: 80 sec.	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.

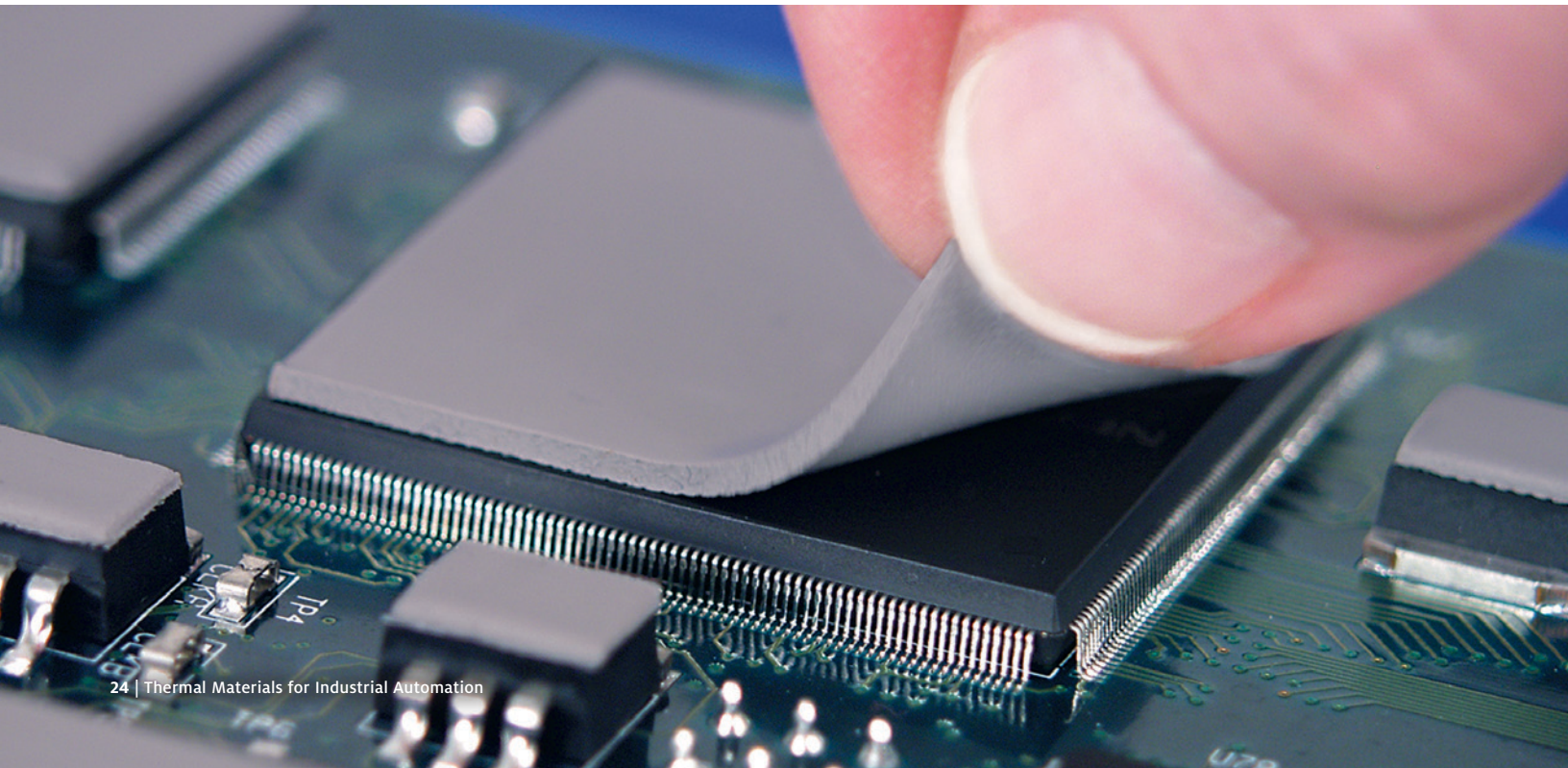


BOND-PLY

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

GAP PAD®

Product Name	Description	Thermal Conductivity (W/m·K)	Modulus (kPa)	Dielectric Breakdown Voltage (VAC)	Thickness (mm)	Flame Rating
BERGQUIST GAP PAD TGP 1000VOUS	Silicone *GAP PAD*	1	55	6,000	0.508 – 6.35	UL 94 V-0
BERGQUIST GAP PAD TGP 2200SF	Silicone free *GAP PAD*	2	228	5,000	0.254 – 3.175	UL 94 V-0
BERGQUIST GAP PAD TGP 3004SF	Silicone free *GAP PAD*	3	–	6,000	0.254 – 3.175	UL 94 V-0
BERGQUIST GAP PAD TGP HC3000	High compliance silicone *GAP PAD*	3	110	5,000	0.508 – 3.175	UL 94 V-0
BERGQUIST GAP PAD TGP HC5000	High compliance silicone *GAP PAD*	5	125	5,000	0.508 – 3.175	UL 94 V-0
BERGQUIST GAP PAD TGP 6000ULM	Ultra-low modulus silicone *GAP PAD*	6	41.3	5,000	1.52 – 3.175	UL 94 V-0
BERGQUIST GAP PAD TGP 7000ULM	Ultra-low modulus silicone *GAP PAD*	7	152	5,000	1.020 – 3.175	UL 94 V-0



GAP FILLER

Product Name	Description	Thermal Conductivity (W/m·K)	Viscosity (Pa·s)	Dielectric Strength (V/mil)	Cure Schedule	Flame Rating
BERGQUIST GAP FILLER TGF 1450	Two-part, silicone gap filler	1.5	30 (High Shear) at 3000/s 200 (Low Shear) at 1/s	275	5 hr. at 25°C or 10 min. at 100°C	UL 94 V-0
BERGQUIST GAP FILLER TGF 1500LVO	Two-part, silicone, low volatility gap filler	1.8	20 (High Shear) at 3000/s	400	8 hr. at 25°C or 10 min. at 100°C	UL 94 V-0
BERGQUIST GAP FILLER TGF 3500LVO	Two-part, silicone, low volatility gap filler	3.5	45 (High Shear) at 1500/s	275	24 hr. at 25°C or 30 min. at 100°C	UL 94 V-0
BERGQUIST GAP FILLER TGF 4000	Two-part, silicone gap filler	4.0	50 (High Shear) at 1500/s	450	24 hr. at 25°C or 30 min. at 100°C	UL 94 V-0

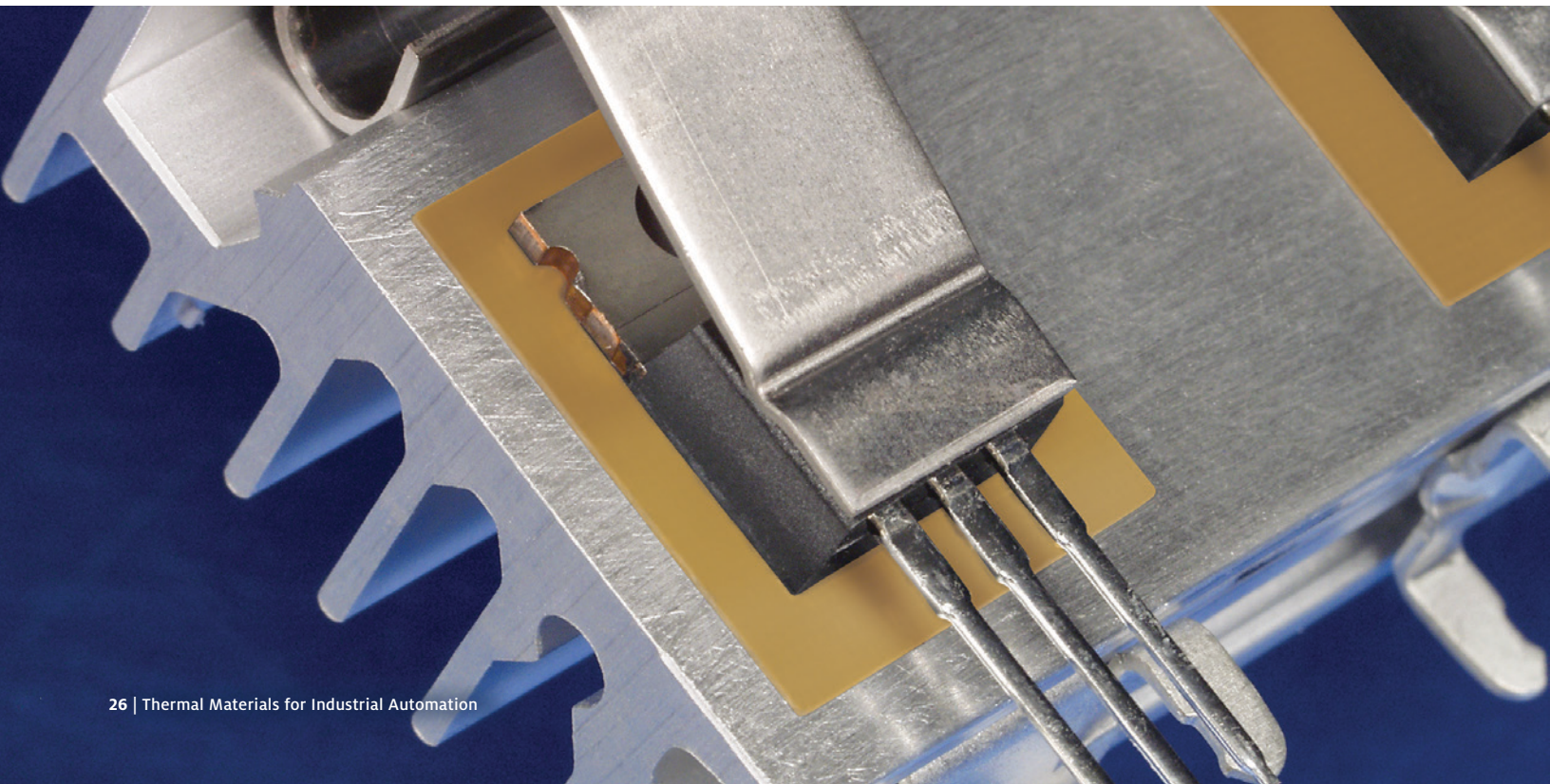
ADHESIVES

Product Name	Description	Thermal Conductivity (W/m·K)	Viscosity (Pa·s)	Dielectric Strength (V/mil)	Cure Schedule	Flame Rating
BERGQUIST *LIQUI-BOND* TLB SA1800	One-part, liquid silicone adhesive	1.80	125 at 20 rpm	250	20 min. at 125°C	UL 94 V-0
BERGQUIST *LIQUI-BOND* TLB SA3500	Two-part, liquid silicone adhesive	3.50	Part A: 45 Part B: 30 (High shear) at 600/s	250	20 min. at 125°C	UL 94 V-0
LOCTITE® 315	One-part, liquid acrylic adhesive	0.80	360 – 850 at 20 rpm	678	Various: *LOCTITE* SF 7387 is required for proper curing	UL 94 V-0
LOCTITE 3875	Two-part, liquid acrylate adhesive	1.75	Part A: 65 Part B: 190 at 2.5 rpm Part A: 32 Part B: 90 at 20 rpm	–	24 – 72 hr. at 25°C	UL 94 V-0

PHASE CHANGE MATERIALS

Product Name	Description	Phase Change Temperature	Thermal Resistance (°C in²/W)	Volume Resistivity (Ω • m)	Dielectric Breakdown Voltage (VAC)	Thickness (mm)
BERGQUIST HI-FLOW THF 1600P	Polyimide film based phase change material	55°C	0.13	$1x10^{12}$	5,000	0.004 – 0.005
BERGQUIST HI-FLOW THF 3000UT	Phase change material in tabulated pad form	52°C	0.05	–	–	0.127 - 0.254

Product Name	Description	Phase Change Temperature (°C)	Thermal Conductivity (W/m·K)	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 manual application
LOCTITE TCP 7000	Non-silicone and reworkable phase change material	45	> 3.0	2	0.051 mm Thickness: 30 hr. at 22°C or 22 min. at 60°C or 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 or 22 min. at 60°C or 3 min. at 125°C	Stencil, screen print or manual application



SIL-PAD®

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

TCLAD

Product Name	Thickness (µm)	Thermal Resistance (°C•cm²/W)	Thermal Impedance (°C/W)	Thermal Conductivity (W/m·K)	Dielectric Breakdown Voltage (kVAC)
BERGQUIST TCLAD TIP/TIC HT	76	0.32	0.45	4.1	8.5
BERGQUIST TCLAD TIP/TIC HPL	38	0.13	0.30	7.5	5.0

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