LOCTITE®
TECHNOMELT®

HIGH RELIABILITY MATERIALS FOR

MEDICAL ELECTRONIC DEVICES

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INTRODUCTION

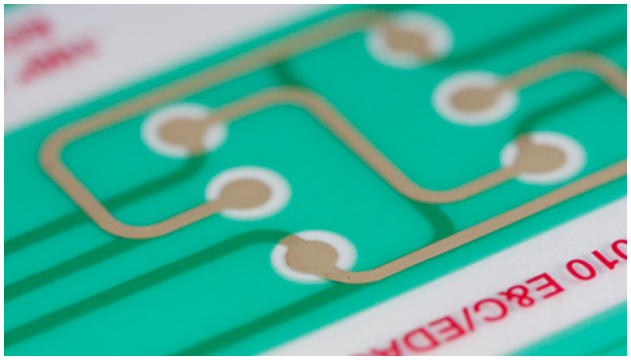
Reliable diagnostics, effective treatment and improved patient comfort have always been primary objectives for the healthcare industry, and the technologies used to enable optimal patient care are central to achieving these goals. For decades, Henkel electronic materials have facilitated the design and manufacture of leading-edge medical devices, all engineered to streamline diagnostics and improve patient outcomes. Greater access to healthcare, more self-monitoring, and a drive toward less invasive devices and procedures are challenging traditional medical electronics. With the increasing healthcare costs innovators in the field of medical electronics are developing new solutions for remote diagnostics and physician reporting – all designed to manage resources more effectively while simultaneously delivering better patient care. With high-reliability materials formulated specifically for fail-safe medical applications, Henkel has electronic materials solutions for a wide range of medical devices – from biological sensors to implantable microelectronic assemblies to advanced diagnostic equipment.

MEDICAL ELECTRODES

Henkel has developed high-reliability electrically conductive material solutions tailored to the unique requirements of medical electrodes, including TAB ECG, TENS, Grounding, and Defibrillation Electrodes. From the sensing materials to the skin adhesive, Henkel's medical solutions are the enabling factor for performance, reliability and comfort.

Henkel's medical electrode materials portfolio helps device manufacturers:

- Improve patient comfort
- Enable long-term wear and remote monitoring
- Increase reliability and signal quality
- Produce cost-effective electrodes



ELECTRICALLY CONDUCTIVE INK	Biomedical Sensing	Carbon Ink	LOCTITE® ECI 7005 E&C	*LOCTITE* EDAG 109 E&C	
			LOCTITE EDAG PF 407A E&C		
		Silver/Silver Chloride Ink	*LOCTITE* EDAG AV 458 E&C	*LOCTITE* EDAG 7019 E&C	*LOCTITE* EDAG PE 007 E&C
			LOCTITE EDAG PE 409 E&C		
	Heating	PTC Ink	*LOCTITE* ECI 8001 E&C	*LOCTITE* ECI 8090 E&C	*LOCTITE* ECI 8120 E&C
	Electronic Circuit	Silver Ink	*LOCTITE* ECI 1010 E&C	*LOCTITE* ECI 1011 E&C	
			LOCTITE EDAG 479SS E&C	*LOCTITE* EDAG 725A (6S61) E&C	
		Carbon Ink	*LOCTITE* EDAG PF 407A E&C		
NON-CONDUCTIVE INK	Protecting	Dielectric Ink	*LOCTITE* EDAG 452SS E&C	*LOCTITE* EDAG PF 455B E&C	
SKIN ADHESIVE	Bonding to Skin	Pressure Sensitive Adhesive	*LOCTITE* DURO-TAK 235A	*LOCTITE* DURO-TAK 129A	

Electrically Conductive Ink

BIOMEDICAL SENSING

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Carbon Ink					
LOCTITE ECI 7005 E&C	Water-based, high speed printable carbon ink	< 40	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	Inline or 2 min. at 120°C
LOCTITE EDAG 109 E&C	Solvent-based, high-speed, printable carbon ink	< 30	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	15 – 30 min. at 70 – 80°C
LOCTITE EDAG PF 407A E&C	Screen printable carbon ink for bio and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C

MEDICAL ELECTRODES

BIOMEDICAL SENSING – CONTINUED

PRODUCT	DESCRIPTION	Ag / AgCl RATIO	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver/Silver Chloride Ink						
LOCTITE® EDAG AV 458 E&C	Conductive, screen printable ink	3:2	< 0.120	Screen printing	• Treated and untreated PET	15 min. at 120°C
LOCTITE EDAG 7019 E&C	Blend of finely divided silver and silver chloride particles in a thermoplastic resin	4:1	< 0.050	Screen printing	• Treated and untreated PET	10 min. at 107°C
LOCTITE EDAG PE 007 E&C	Conductive, polyurethane silver ink	4.2:1	< 0.100	Flexographic and rotogravure printing	• Treated and untreated PET • Paper	2 min. at 107°C
LOCTITE EDAG PE 409 E&C	Blend of finely divided silver and silver chloride particles in a thermoplastic resin	9:1	≤ 0.050	Screen printing	• Treated and untreated PET	15 min. at 120°C

HEATING

PRODUCT	DESCRIPTION	PTC TEMPERATURE (°C)	SHEET RESISTANCE (kΩ/sq/25 µm)	PTC RATIO	DRYING SCHEDULE
PTC Ink					
LOCTITE ECI 8001 E&C	Positive Temperature Coefficient (PTC) screen printable ink	60	1.7	> 7	10 min. at 120°C
LOCTITE ECI 8090 E&C	Positive Temperature Coefficient (PTC) screen printable ink	90	1.0	> 7	10 min. at 120°C
LOCTITE ECI 8120 E&C	Positive Temperature Coefficient (PTC) screen printable ink	120	1.7	> 10	10 min. at 140°C

ELECTRONIC CIRCUIT

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver Ink					
LOCTITE ECI 1010 E&C	Screen printable, conductive ink	< 0.007	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	15 min. at 120°C or 2 min. at 150°C
LOCTITE ECI 1011 E&C	High conductivity, sub-micron size particles	< 0.005	Screen printing and flexographic printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	10 min. at 150°C
LOCTITE EDAG 479SS E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	< 0.020	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 93°C
LOCTITE EDAG 725A (6S61) E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	0.008 – 0.014	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 120°C
Carbon Ink					
LOCTITE EDAG 407A E&C	Screen printable carbon ink for bio. and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C

MEDICAL ELECTRODES

Non-Conductive Coating

PROTECTING

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Dielectric Ink					
LOCTITE® EDAG 452SS E&C	Screen printable, UV curable dielectric ink with excellent flexibility	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	UV at 0.5 Joule/cm²
LOCTITE EDAG PF 455B E&C	Screen printable, UV curable dielectric ink with excellent humidity resistance	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS	UV at 0.5 Joule/cm²

Skin Adhesive

BONDING TO SKIN

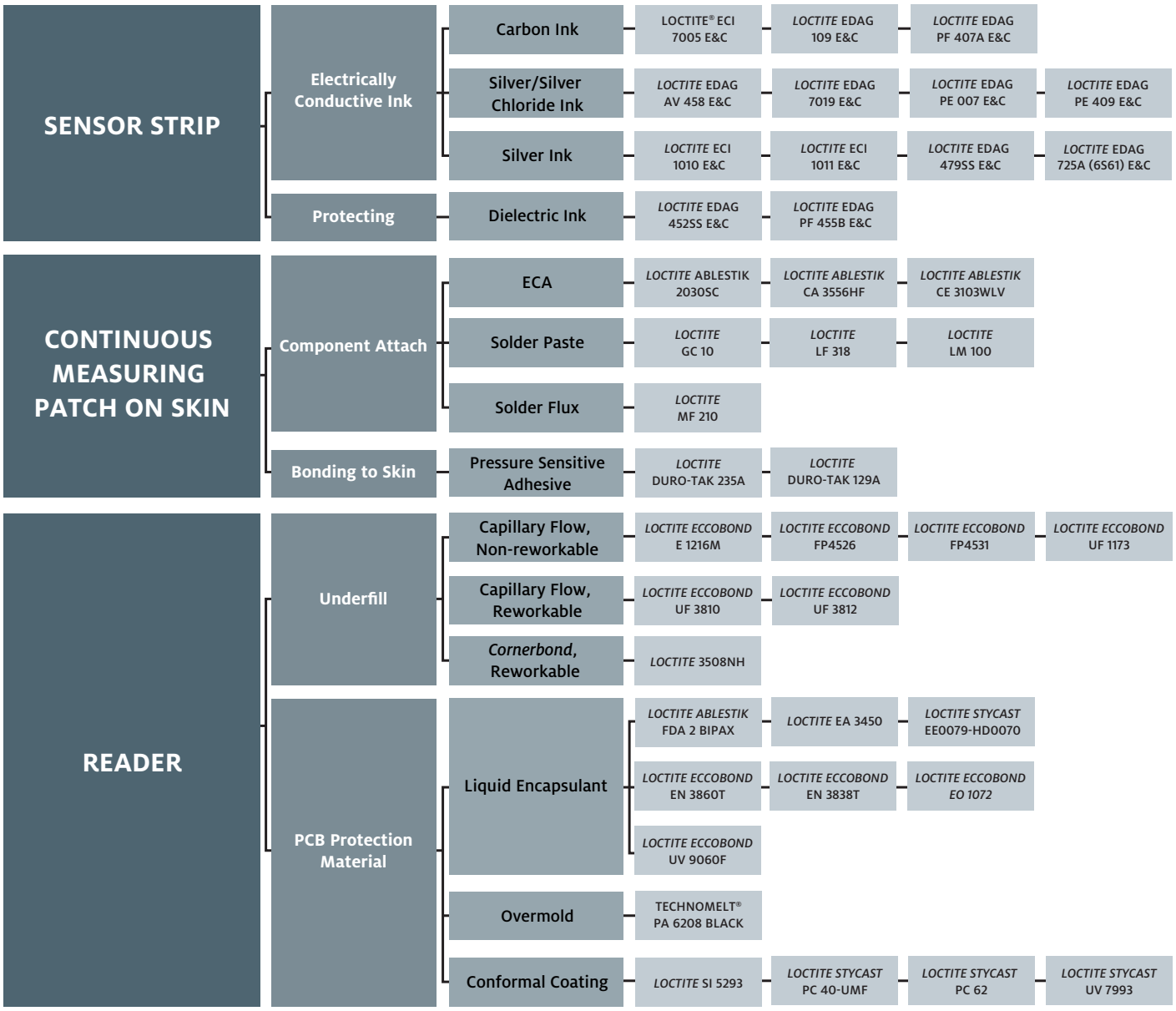
PRODUCT	DESCRIPTION	TYPE	TYPICAL PROCESSING	ADHESION (180° peel, steel to PET, N/25 mm)	DRYING SCHEDULE
Pressure Sensitive Adhesive					
LOCTITE DURO-TAK 129A	Pressure sensitive adhesive suitable for medical applications like medical tapes, bandages, electrodes	Acrylic	High speed coating (direct or transfer)	36	110°C
LOCTITE DURO-TAK 235A	Pressure sensitive adhesive suitable for medical applications like medical tapes, bandages, electrodes	Acrylic	High speed coating (direct or transfer)	36	110°C

GLUCOSE MANAGEMENT

Henkel conductive ink materials enable the production of glucose test strips that facilitate self-monitoring of blood glucose (SMBG) levels. The conductive materials are the primary component for glucose sensing functionality, which directly impacts the patient's well-being.

Continuous glucose management (CGM) is the future of blood sugar monitoring and is growing in effectiveness and implementation. Rather than requiring small blood samples several times per day to determine intermittent blood glucose levels, the CGM continuously measures the glucose in blood and displays the data on a reader device. This allows patients to thoroughly monitor glucose levels for more timely insulin injections. Conductive sensing materials and skin-grade adhesives from Henkel are key enablers for reliable CGM skin patches.

GLUCOSE MANAGEMENT



Sensor Strip

ELECTRICALLY CONDUCTIVE INK

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Carbon Ink					
LOCTITE ECI 7005 E&C	Water-based, high speed printable carbon ink	< 40	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	Inline or 2 min. at 120°C
LOCTITE EDAG 109 E&C	Solvent-based, high-speed, printable carbon ink	< 30	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	15 – 30 min. at 70 – 80°C
LOCTITE EDAG PF 407A E&C	Screen printable carbon ink for bio and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C

PRODUCT	DESCRIPTION	Ag / AgCl RATIO	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver/Silver Chloride Ink						
LOCTITE EDAG AV 458 E&C	Conductive, screen printable ink	3:2	< 0.120	Screen printing	• Treated and untreated PET	15 min. at 120°C
LOCTITE EDAG 7019 E&C	Blend of finely divided silver and silver chloride particles in a thermoplastic resin	4:1	< 0.050	Screen printing	• Treated and untreated PET	10 min. at 107°C
LOCTITE EDAG PE 007 E&C	Conductive, Polyurethane silver ink	4.2:1	< 0.100	Flexographic and rotogravure printing	• Treated and untreated PET • Paper	2 min. at 107°C
LOCTITE EDAG PE 409 E&C	Blend of finely divided silver and silver chloride particles in a thermoplastic resin	9:1	< 0.050	Screen printing	• Treated and untreated PET	15 min. at 120°C

GLUCOSE MANAGEMENT

ELECTRICALLY CONDUCTIVE INK – CONTINUED

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver Ink					
LOCTITE® ECI 1010 E&C	Screen printable, conductive ink	< 0.007	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	15 min. at 120°C or 2 min. at 150°C
LOCTITE ECI 1011 E&C	High conductivity, sub-micron size particles	< 0.005	Screen printing and flexographic printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	10 min. at 150°C
LOCTITE EDAG 479SS E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	< 0.020	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 93°C
LOCTITE EDAG 725A (6S61) E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	0.008 – 0.014	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 120°C

PROTECTING

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Dielectric Ink					
LOCTITE EDAG 452SS E&C	Screen printable, UV curable dielectric ink with excellent flexibility	> 2×10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	UV at 0.5 Joule/cm²
LOCTITE EDAG PF 455B E&C	Screen printable, UV curable dielectric ink with excellent humidity resistance	> 2×10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS	UV at 0.5 Joule/cm²

Continuous Measuring Patch on Skin

COMPONENT ATTACH

PRODUCT	DESCRIPTION	VOLUME RESISTIVITY (Ω.cm)	TYPICAL PROCESSING	STORAGE MODULUS AT 25°C (MPa)	CURING SCHEDULE
Electrically Conductive Adhesive (ECA)					
LOCTITE ABLESTIK CA 3556HF	Acrylic ECA, flexible material	0.0025	Dispensing	650	10 min. at 120°C
LOCTITE ABLESTIK CE 3103WLV	Electrically conductive epoxy adhesive that is a Pb-free alternative to solder	0.0008	Dispensing	4,500	10 min. at 120°C
LOCTITE ABLESTIK ICP 4000	Silicone based, electrically conductive adhesive. Specially designed for applications where both high flexibility and excellent conductivity are required.	0.00006	Dispensing or pin transfer	< 100	60 min. at 130°C

PRODUCT	DESCRIPTION	ALLOY	MELTING POINT (°C)	TYPICAL PROCESSING	PARTICLE SIZE	SHELF LIFE
Solder Paste						
LOCTITE GC 10	Room temperature, stable solder paste	SAC305	217	Stencil printing	Type 3, 4, 4.5 (4A), 5	12 months up to 26.5°C
LOCTITE LF 318	RoHS-compliant solder paste	90iSC, SAC305, SAC387	90iSC: 205 – 218 SAC305, SAC387: 217	Stencil printing	Type 3, 4	6 months at 0 – 10°C
LOCTITE LM 100	Low melting alloy for sensitive substrates	BI58	138	Dispensing and stencil printing	Type 2.5 (2A)	6 months at 0 – 10°C

PRODUCT	DESCRIPTION	SOLID CONTENT (%w)	ACID VALUE (mg KOH/g)	TYPICAL PROCESSING	IPC J-STD-004B CLASSIFICATION
Solder Flux					
LOCTITE MF 210	Resin free flux	2.9	22.5	Spray/Foam	ORM0

BONDING TO SKIN

PRODUCT	DESCRIPTION	TYPE	TYPICAL PROCESSING	ADHESION (180° peel, steel to PET, N/25 mm)	DRYING SCHEDULE
Pressure Sensitive Adhesive					
LOCTITE DURO-TAK 129A	Pressure sensitive adhesive suitable for medical applications like medical tapes, bandages, electrodes	Acrylic	High speed coating (direct or transfer)	36	110°C
LOCTITE DURO-TAK 235A	Pressure sensitive adhesive suitable for medical applications like medical tapes, bandages, electrodes	Acrylic	High speed coating (direct or transfer)	36	110°C

GLUCOSE MANAGEMENT

Reader

UNDERFILL

PRODUCT	DESCRIPTION	VISCOSITY	COEFFICIENT OF THERMAL EXPANSION, CTE (PPM/°C)		GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE SCHEDULE
			BELOW T_g	ABOVE T_g		
Capillary Flow, Non-reworkable						
LOCTITE® *ECCOBOND* E 1216M	Very fast flow and cure	4,000 cP at 20 rpm	35	131	125	3 min. at 165°C or 10 min. at 130°C
LOCTITE ECCOBOND FP4526	Capillary flow underfill for flip chip	4,700 cP at 10 rpm	33	101	133	15 min. at 165°C
LOCTITE ECCOBOND FP4531	Capillary flow underfill for flip chip on flex applications	10,000 cP at 20 rpm	28	104	161	7 min. at 160°C
LOCTITE ECCOBOND UF 1173	Uniform void-free encapsulant underfill for CSP and BGA packages	7,500 cP at $10s^{-1}$	26	103	160	5 min. at 150°C
Capillary Flow, Reworkable						
LOCTITE ECCOBOND UF 3810	Reworkable capillary underfill	394 cP at $1,000s^{-1}$	55	171	102	8 min. at 130°C
LOCTITE ECCOBOND UF 3812	Reworkable capillary underfill with high T_g	350 cP at $1,000s^{-1}$	48	175	131	10 min. at 130°C
***Cornerbond*, Reworkable**						
LOCTITE 3508NH	*Cornerbond* underfill designed to cure during Pb-free solder reflow	70,000 cP at $36s^{-1}$	65	175	118	Lead-free profile at 245°C

PCB PROTECTION MATERIAL

PRODUCT	DESCRIPTION	MIX RATIO	VISCOSITY (cP)	CURE SCHEDULE
Liquid Encapsulant				
LOCTITE ABLESTIK FDA 2 BIPAX	Heat cure or room temperature cure epoxy designed for medical device applications	100 : 100	14,000 at 10 rpm	24 hr. at 25°C or 1 to 4 hr. at 65°C
LOCTITE EA 3450	Two-Component, epoxy adhesive	1 : 1	30,000 at 10 rpm	24 hr. at 25°C or 1 hr. at 80°C
LOCTITE STYCAST EE0079-HD0070	Two-Component, epoxy adhesive suitable for in-body applications	100 : 26	500 – 700 at 10 rpm	2 hr. at 60°C

PCB PROTECTION MATERIAL – CONTINUED

PRODUCT	DESCRIPTION	VISCOSITY AT 25°C (cP)	GLASS TRANSITION TEMPERATURE, T_g (°C)	STORAGE MODULUS AT 25°C (MPa)	CURE SCHEDULE
Liquid Encapsulant					
LOCTITE ECCOBOND EN 3860T	CSP/BGA thermal cure encapsulant with low viscosity	1,000	82	1,230	10 min. at 130°C or 5 min. at 150°C
LOCTITE ECCOBOND EN 3838T	Low T_g thermal cure encapsulant	6,700	2	466	8 min. at 130°C
LOCTITE ECCOBOND EO 1072	High T_g and hardness thermal cure encapsulant	80,000	135	6,700	5 min. at 150°C
LOCTITE ECCOBOND UV 9060F	UV/Moisture cure encapsulant	11,000	75	2,200	25 sec at 500 mW/cm² (365nm)

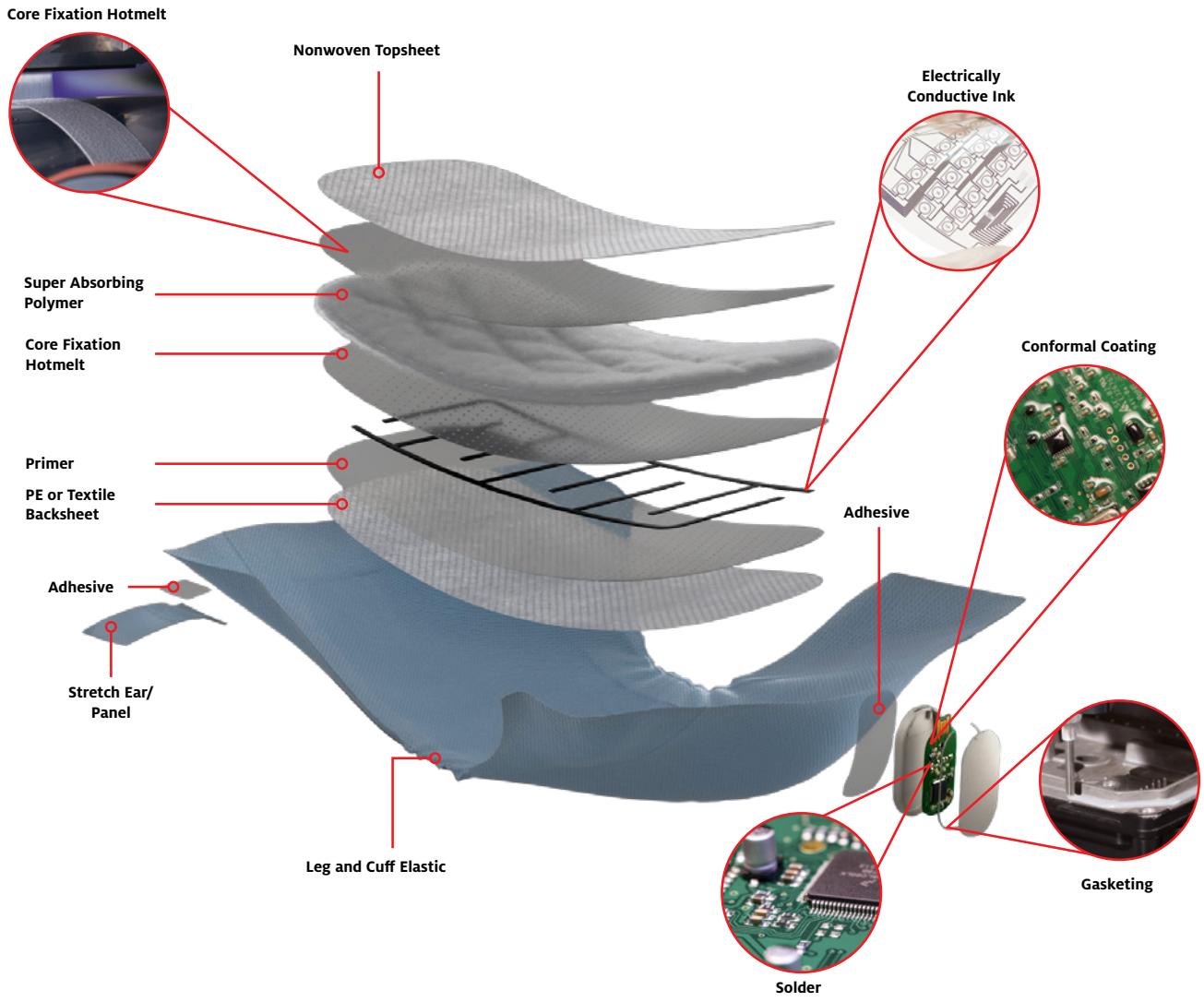
PRODUCT	DESCRIPTION	COLOR	OPERATING TEMPERATURE (°C)	SHORE HARDNESS	APPLICATION TEMPERATURE RANGE (°C)
Overmold					
TECHNOMELT® PA 6208 N BLACK	Moldable polyamide with excellent adhesion to tough substrates. Great flexibility offers incredible strain relief on cables and wires. Ideal for encapsulation of heat-producing components in appliances and consumer electronics.	Black	-40 – 100	82A	180 – 230

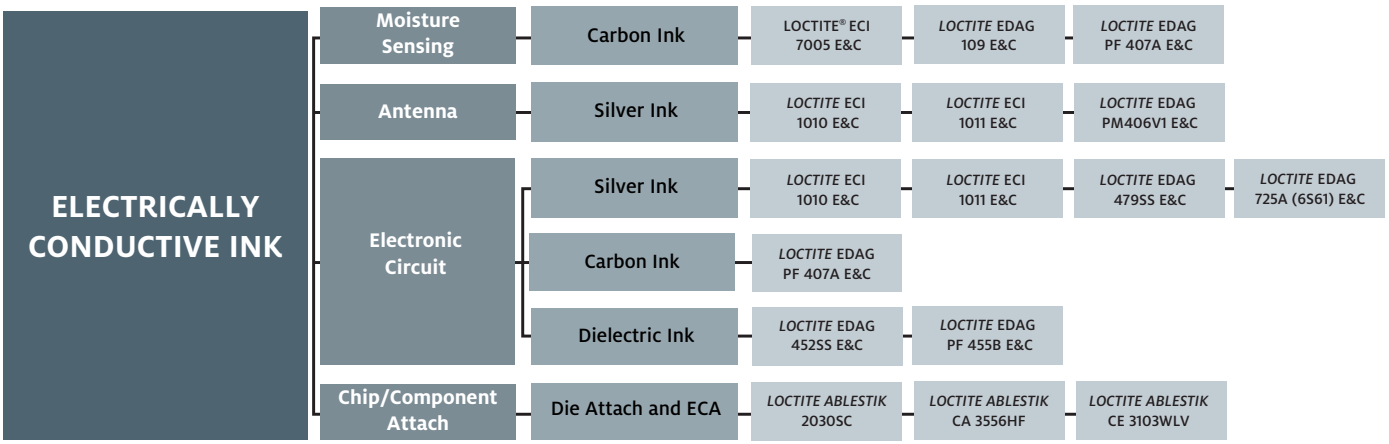
PRODUCT	DESCRIPTION	VISCOSITY AT 25°C (cP)	VOLUME RESISTIVITY (Ω•cm at 25°C)	DIELECTRIC CONSTANT (1 MHz)	CURE SCHEDULE
Conformal Coating					
LOCTITE SI 5293	Repairable, solvent-free, medium-viscosity, UV/moisture-cure silicone, designed for severe temperature environments. High-reliability automotive applications.	400 – 800	1.0×10^{14}	4.5	20 sec. UV + 3 days at RT
LOCTITE STYCAST PC 40-UMF	Conformal coating specifically 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.	250 – 500	3.5×10^{16}	2.7	UV and moisture, 10 sec. UV + 3 days at RT
LOCTITE STYCAST PC 62	Conformal coating that provides environmental and mechanical protection. Toluene-free alternative with superior toughness and abrasion resistance.	52	1.04×10^{16}	2.2	24 hr. at 25°C or 45 min. at 75°C
LOCTITE STYCAST UV 7993	Conformal coating 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.	120	2.2×10^{16}	3.3	UV (150 – 300 mW/cm²) + Ambient Moisture (100 hr.)

MOISTURE SENSORS

An increasing geriatric population alongside rising healthcare costs is driving the development of novel monitoring tools to help improve patient comfort and reduce expense. Henkel is answering this call with multiple approaches, one of which is smart incontinence management through the use of cost- effective printable moisture sensors that can be worn comfortably and send real-time communication when replacement supplies are required.

Henkel conductive inks allow for the manufacturing of responsive, disposable healthcare products including smart diapers, smart bed pads and industrial applications. Henkel's electrically conductive materials can be directly applied by high-speed Flexographic print processes onto thin, flexible materials used in the assembly of healthcare products, which further reduces cost by increasing throughput.





Electrically Conductive Ink

MOISTURE SENSING

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Carbon Ink					
LOCTITE ECI 7005 E&C	Water-based, high speed printable carbon ink	< 40	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	Inline or 2 min. at 120°C
LOCTITE EDAG 109 E&C	Solvent-based, high-speed, printable carbon ink	< 30	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	15 – 30 min. at 70 – 80°C
LOCTITE EDAG PF 407A E&C	Screen printable carbon ink for bio and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C

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Silver Ink					
LOCTITE ECI 1010 E&C	Screen printable, conductive ink	< 0.007	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	15 min. at 120°C or 2 min. at 150°C
LOCTITE ECI 1011 E&C	High conductivity, sub-micron size particles	< 0.005	Screen printing and flexographic printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	10 min. at 150°C
LOCTITE EDAG PM406V1	Screen printable, conductive ink formulated to have very high conductivity and solids content	< 0.015	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 120°C

MOISTURE SENSORS

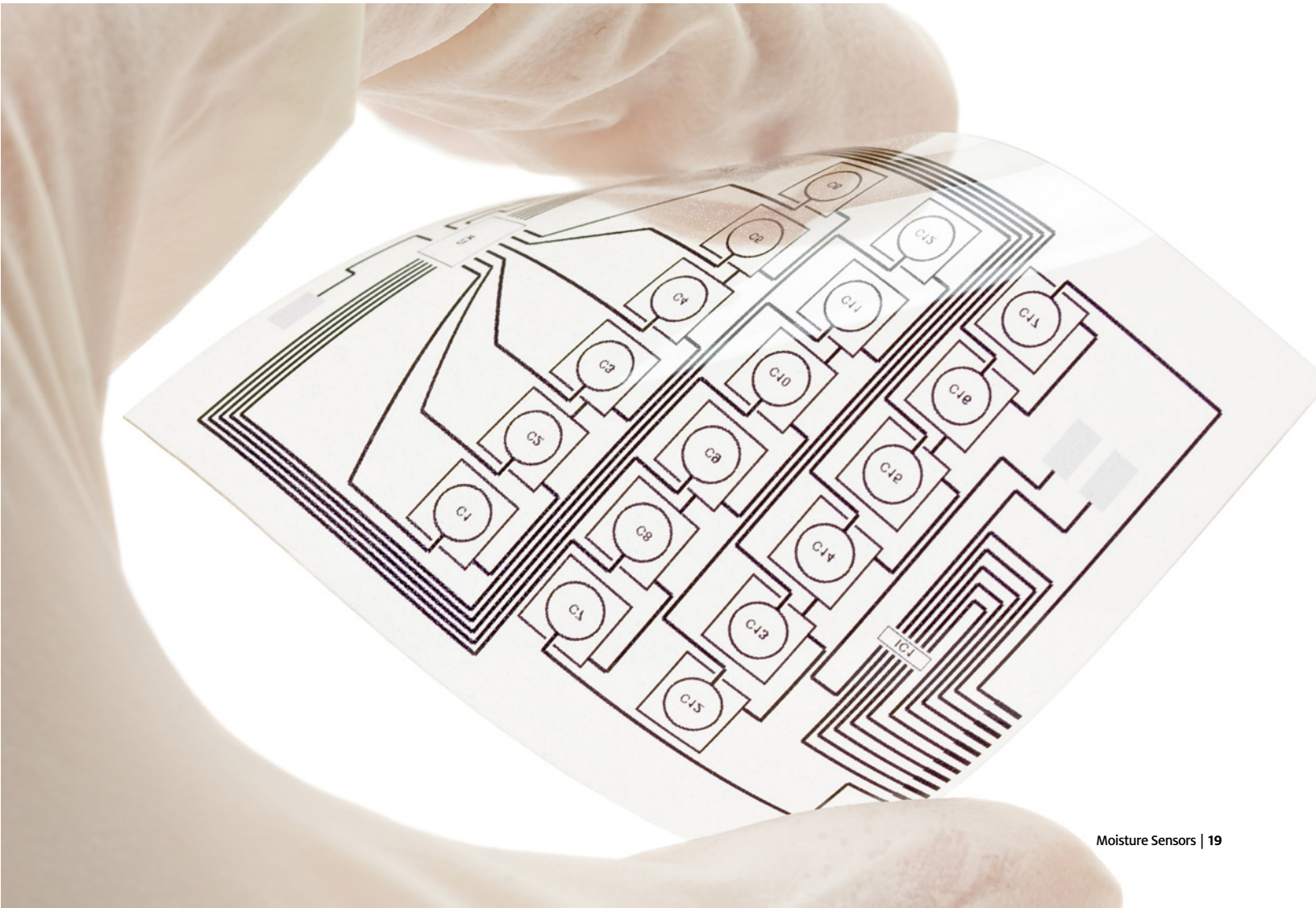
ELECTRONIC CIRCUIT

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver Ink					
LOCTITE® ECI 1010 E&C	Screen printable, conductive ink	< 0.007	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	15 min. at 120°C or 2 min. at 150°C
LOCTITE ECI 1011 E&C	High conductivity, sub-micron size particles	< 0.005	Screen printing and flexographic printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	10 min. at 150°C
LOCTITE EDAG 479SS E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	< 0.020	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 93°C
LOCTITE EDAG 725A (6S61) E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	0.008 – 0.014	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 120°C
Carbon Ink					
LOCTITE EDAG 407A E&C	Screen printable carbon ink for bio and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Dielectric Ink					
LOCTITE EDAG 452SS E&C	Screen printable, UV curable dielectric ink with excellent flexibility	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	UV at 0.5 Joule/cm²
LOCTITE EDAG PF 455B E&C	Screen printable, UV curable dielectric ink with excellent humidity resistance	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS	UV at 0.5 Joule/cm²

CHIP/COMPONENT ATTACH

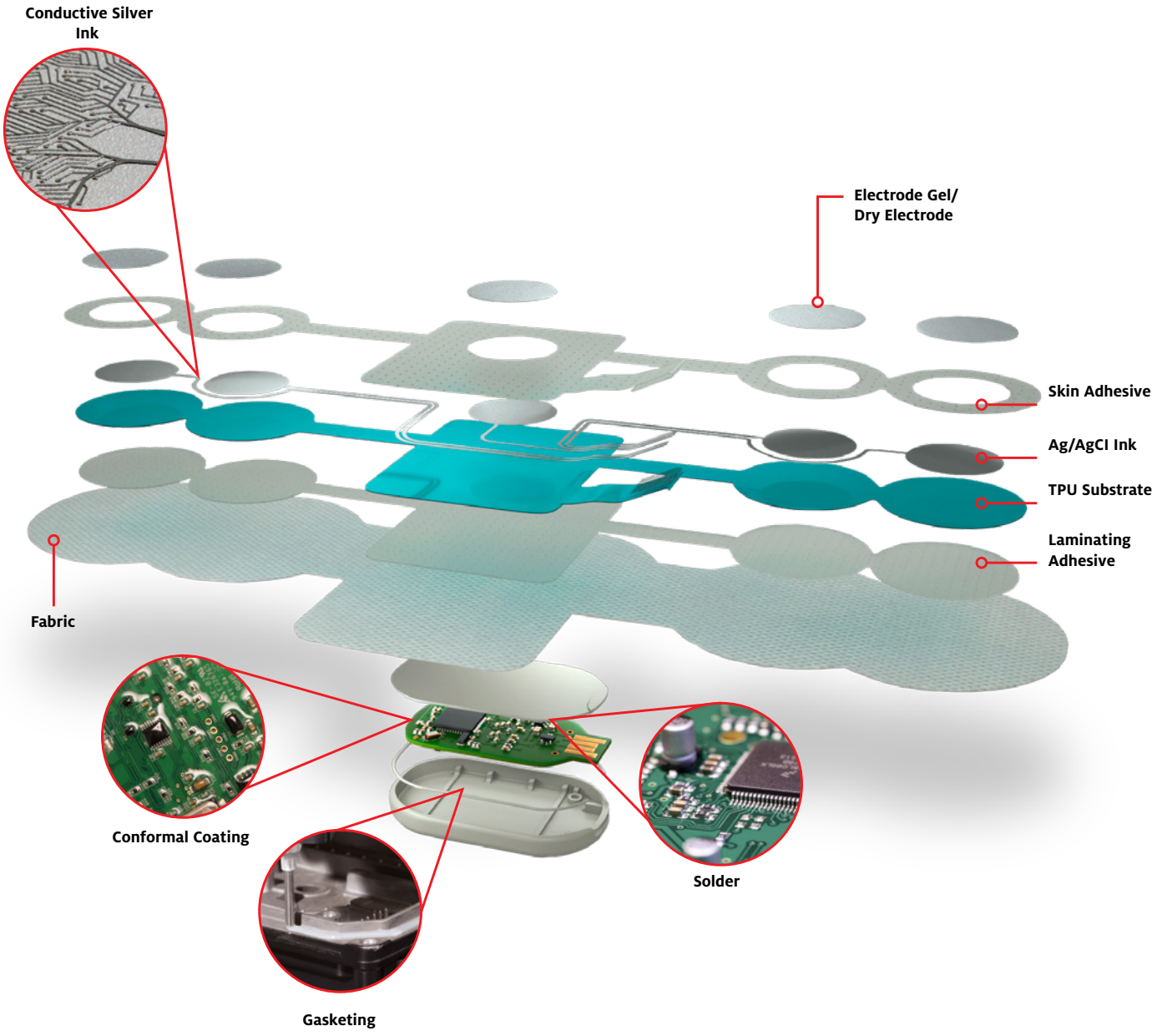
PRODUCT	DESCRIPTION	VOLUME RESISTIVITY (Ω.cm)	TYPICAL PROCESSING	STORAGE MODULUS at 25°C (MPa)	CURING SCHEDULE
Die Attach and ECA					
LOCTITE ABLESTIK 2030SC	Die attach adhesive for high throughput die attach applications	0.0002	Dispensing	3,300	90 sec. at 110°C
LOCTITE ABLESTIK CA 3556HF	Electrically conductive adhesive designed for applications that require a very fast cure at low temperatures	0.0025	Dispensing	650	10 min. at 120°C
LOCTITE ABLESTIK CE 3103WLV	Electrically conductive epoxy adhesive that is a Pb-free alternative to solder	0.0008	Dispensing	4,500	10 min. at 120°C



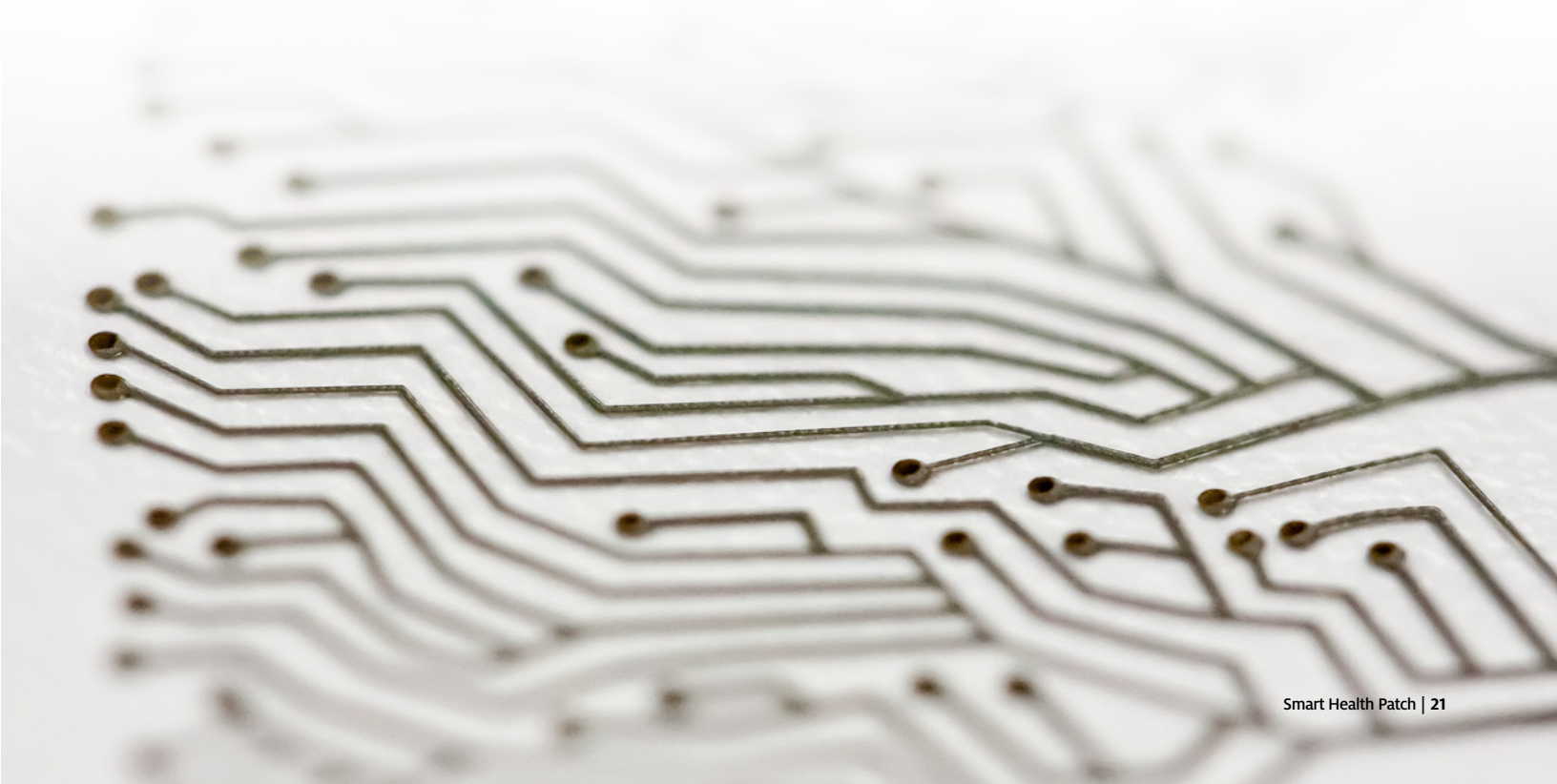
SMART HEALTH PATCH

Smart health patches are the latest advance in patient monitoring that can continuously measure heart rate, brain activity, movement and many other human body functions. These patches leverage on-skin sensor technology, miniaturized hardware and data communication to accommodate patient comfort.

Electrode materials, conductive inks, protective coatings and skin-grade adhesives from Henkel allow new smart medical devices and disposable healthcare products to be produced in high volume and deliver reliable in-application functionality.



ELECTRICALLY CONDUCTIVE INK	Biomedical Sensing	Carbon Ink	LOCTITE® ECI 7005 E&C	*LOCTITE* EDAG 109 E&C	*LOCTITE* EDAG PF 407A E&C	
		Silver/Silver Chloride Ink	*LOCTITE* EDAG AV 458 E&C	*LOCTITE* EDAG 7019 E&C	*LOCTITE* EDAG PE 007 E&C	*LOCTITE* EDAG PE 409 E&C
	Electronic Circuit	Silver Ink	*LOCTITE* ECI 1010 E&C	*LOCTITE* ECI 1011 E&C	*LOCTITE* EDAG 479SS E&C	*LOCTITE* EDAG 725A (6S61) E&C
		Carbon Ink	*LOCTITE* EDAG PF 407A E&C			
		Dielectric Ink	*LOCTITE* EDAG 452SS E&C	*LOCTITE* EDAG PF 455B E&C		
	Component Attach	ECA	*LOCTITE ABLESTIK* ICP 4000	*LOCTITE ABLESTIK* CA 3556HF	*LOCTITE ABLESTIK* CE 3103WLV	
		Solder Paste	*LOCTITE* GC 10	*LOCTITE* LF 318	*LOCTITE* LM 100	
		Solder Flux	*LOCTITE* MF 210			
SKIN ADHESIVE	Bonding to Skin	Pressure Sensitive Adhesive	*LOCTITE* DURO-TAK 235A	*LOCTITE* DURO-TAK 129A		
NON-ELECTRICALLY CONDUCTIVE MATERIAL	Protecting	Dielectric Ink	*LOCTITE* EDAG 452SS E&C	*LOCTITE* EDAG PF 455B E&C		
		Conformal Coating	*LOCTITE* SI 5293	*LOCTITE STYCAST* PC 40-UMF	*LOCTITE STYCAST* PC 62	*LOCTITE STYCAST* UV 7993
		Overmold	TECHNOMELT® PA 638	*TECHNOMELT* PA 6208 BLACK		



SMART HEALTH PATCH

Electrically Conductive Ink

BIOMEDICAL SENSING

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Carbon Ink					
LOCTITE® ECI 7005 E&C	Water-based, high speed printable carbon ink	< 40	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	Inline or 2 min. at 120°C
LOCTITE EDAG 109 E&C	High-speed, printable carbon ink	< 30	Flexographic and rotogravure printing	• Treated and untreated PET • Treated PE and PP • Paper	15 – 30 min. at 70 – 80°C
LOCTITE EDAG PF 407A E&C	Screen printable carbon ink for bio and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C

PRODUCT	DESCRIPTION	Ag / AgCl RATIO	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver/Silver Chloride Ink						
LOCTITE EDAG AV 458 E&C	Conductive, screen printable ink	3:2	< 0.120	Screen printing	• Treated and untreated PET	15 min. at 120°C
LOCTITE EDAG 7019 E&C	Blend of finely divided silver and silver chloride particles in a thermoplastic resin	4:1	< 0.050	Screen printing	• Treated and untreated PET	10 min. at 107°C
LOCTITE EDAG PE 007 E&C	Conductive, Polyurethane silver ink	4.2:1	< 0.100	Flexographic and rotogravure printing	• Treated and untreated PET • Paper	2 min. at 107°C
LOCTITE EDAG PE 409 E&C	Blend of finely divided silver and silver chloride particles in a thermoplastic resin	9:1	< 0.050	Screen printing	• Treated and untreated PET	15 min. at 120°C

ELECTRONIC CIRCUIT

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver Ink					
LOCTITE ECI 1010 E&C	Screen printable, conductive ink	< 0.007	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	15 min. at 120°C or 2 min. at 150°C
LOCTITE ECI 1011 E&C	High conductivity, sub-micron size particles	< 0.005	Screen printing and flexographic printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	10 min. at 150°C
LOCTITE EDAG 479SS E&C	Conductive, silver-based polymer thick film ink	< 0.020	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 93°C

ELECTRONIC CIRCUIT – CONTINUED

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Silver Ink					
LOCTITE EDAG 725A (6S61) E&C	Conductive, silver-based polymer thick film ink for printing electronic circuits on flexible foil	0.008 – 0.014	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	15 min. at 120°C
Carbon Ink					
LOCTITE EDAG 407A E&C	Screen printable carbon ink for bio. and medical sensors. Very good electrical conductivity.	≤ 20	Screen printing	• PET and other plastics	15 min. at 120°C
Dielectric Ink					
LOCTITE EDAG 452SS E&C	Screen printable, UV curable dielectric ink with excellent flexibility	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS • Paper	UV at 0.5 Joule/cm²
LOCTITE EDAG PF 455B E&C	Screen printable, UV curable dielectric ink with excellent humidity resistance	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS	UV at 0.5 Joule/cm²

COMPONENT ATTACH

PRODUCT	DESCRIPTION	VOLUME RESISTIVITY (Ω.cm)	TYPICAL PROCESSING	STORAGE MODULUS AT 25°C (MPa)	CURING SCHEDULE
Electrically Conductive Adhesive (ECA)					
LOCTITE ABLESTIK CA 3556HF	Acrylic ECA, flexible material	0.0025	Dispensing	650	10 min. at 120°C
LOCTITE ABLESTIK CE 3103WLV	Electrically conductive epoxy adhesive that is a Pb-free alternative to solder	0.0008	Dispensing	4,500	10 min. at 120°C
LOCTITE ABLESTIK ICP 4000	Silicone based, electrically conductive adhesive. Specially designed for applications where both high flexibility and excellent conductivity are required.	0.00006	Dispensing or pin transfer	< 100	60 min. at 130°C

COMPONENT ATTACH – CONTINUED

PRODUCT	DESCRIPTION	ALLOY	MELTING POINT (°C)	TYPICAL PROCESSING	PARTICLE SIZE	SHELF LIFE
Solder Paste						
LOCTITE® GC 10	Room temperature, stable solder paste	SAC305	217	Stencil printing	Type 3, 4, 4.5 (4A), 5	12 months up to 26.5°C
LOCTITE LF 318	RoHS-compliant solder paste	90iSC, SAC305, SAC387	90iSC: 205 – 218 SAC305, SAC387: 217	Stencil printing	Type 3, 4	6 months at 0 – 10°C
LOCTITE LM 100	Low melting alloy for sensitive substrates	BI58	138	Dispensing and stencil printing	Type 2.5 (2A)	6 months at 0 – 10°C

PRODUCT	DESCRIPTION	SOLID CONTENT (%w)	ACID VALUE (mg KOH/g)	TYPICAL PROCESSING	IPC J-STD-004B CLASSIFICATION
Solder Flux					
LOCTITE MF 210	Resin free flux	2.9	22.5	Spray/Foam	ORM0

Skin Adhesive

BONDING TO SKIN

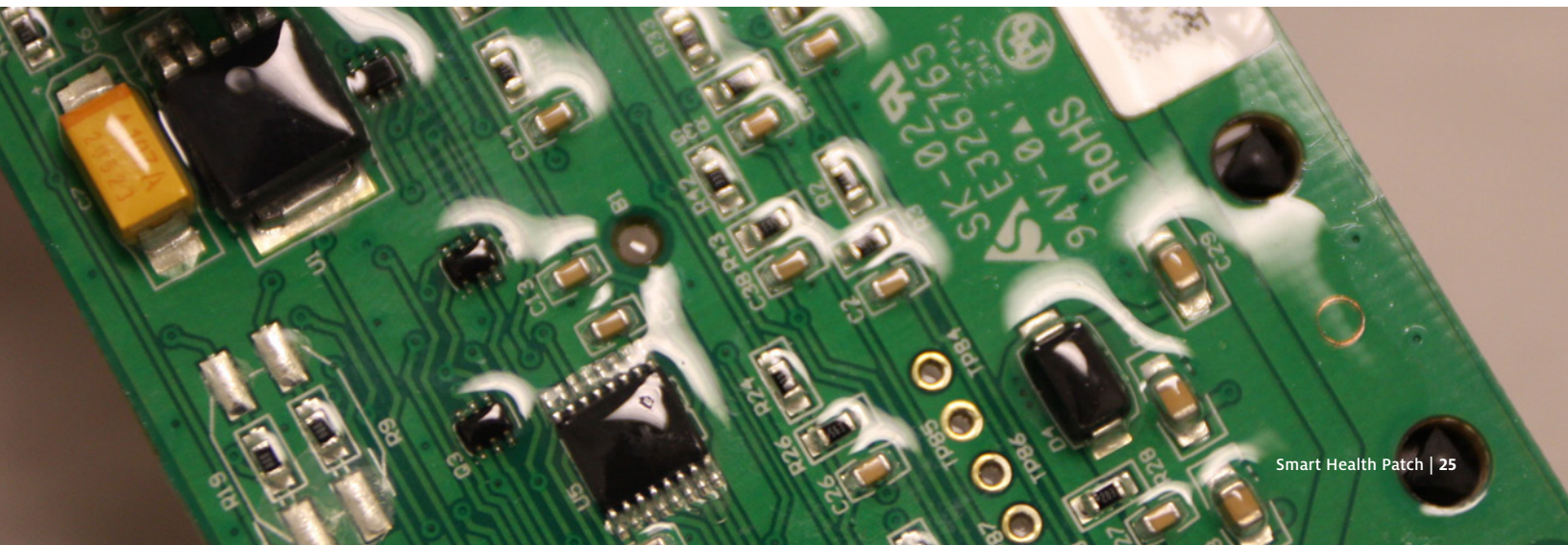
PRODUCT	DESCRIPTION	TYPE	TYPICAL PROCESSING	ADHESION (180° Peel, steel to PET, N/25 mm)	DRYING SCHEDULE
Pressure Sensitive Adhesive					
LOCTITE DURO-TAK 129A	Pressure sensitive adhesive suitable for medical applications like medical tapes, bandages, electrodes	Acrylic	High speed coating (direct or transfer)	36	110°C
LOCTITE DURO-TAK 235A	Pressure sensitive adhesive suitable for medical applications like medical tapes, bandages, electrodes	Acrylic	High speed coating (direct or transfer)	36	110°C

Non-Electrically Conductive Material

PROTECTING

PRODUCT	DESCRIPTION	SHEET RESISTANCE (Ω/sq/25 µm)	TYPICAL PROCESSING	TYPICAL SUBSTRATE	DRYING SCHEDULE
Dielectric Ink					
LOCTITE EDAG 452SS E&C	Screen printable, UV curable dielectric ink with excellent flexibility	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • Kapton® • ABS • Paper	UV at 0.5 Joule/cm²
LOCTITE EDAG PF 455B E&C	Screen printable, UV curable dielectric ink with excellent humidity resistance	> 2 x 10^9	Screen printing	• Treated and untreated PET • PEN • *Kapton* • ABS	UV at 0.5 Joule/cm²

PRODUCT	DESCRIPTION	VISCOSITY AT 25°C (cP)	VOLUME RESISTIVITY (Ω.cm at 25°C)	DIELECTRIC CONSTANT (1 MHz)	CURE SCHEDULE
Conformal Coating					
LOCTITE SI 5293	Repairable, solvent-free, medium-viscosity, UV/moisture-cure silicone, designed for severe temperature environments. High-reliability automotive applications.	400 – 800	1.0 x 10^{14}	4.5	20 sec. UV + 3 days at RT
LOCTITE STYCAST PC 40-UMF	Conformal coating specifically 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.	250 – 500	3.5 x 10^{16}	2.7	UV and moisture, 10 sec. UV + 3 days at RT
LOCTITE STYCAST PC 62	Conformal coating that provides environmental and mechanical protection. Toluene-free alternative with superior toughness and abrasion resistance.	52	1.04 x 10^{16}	2.2	24 hr. at 25°C or 45 min. at 75°C
LOCTITE STYCAST UV 7993	Conformal coating 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.	120	2.2 x 10^{16}	3.3	UV (150 – 300 mW/cm²) + Ambient Moisture (100 hr.)



SMART HEALTH PATCH

Non-Electrically Conductive Material

PROTECTING – CONTINUED

PRODUCT	DESCRIPTION	COLOR	OPERATING TEMPERATURE (°C)	SHORE HARDNESS	APPLICATION TEMPERATURE RANGE (°C)
Overmold					
TECHNOMELT® PA 638	High-performance thermoplastic polyamide with moderate strength and good adhesion for in-cabin and under-hood applications.	Amber	-40 – 125	67D	232 – 260
TECHNOMELT PA 6208 N BLACK	Moldable polyamide with excellent adhesion to tough substrates. Great flexibility offers incredible strain relief on cables and wires. Ideal for encapsulation of heat-producing components in appliances and consumer electronics.	Black	-40 – 100	82A	180 – 230

GENERAL MEDICAL ASSEMBLY

Henkel has developed a complete line of general medical assembly materials that facilitate the electrical connection, structural integrity, device protection and thermal control required for small form factor, mission-critical medical products.

The materials portfolio includes encapsulation and underfill materials for protection of hearing aids, medical encapsulants for implantable cardio and neuro devices and thermal management materials and shielding inks for imaging equipment.

UNDERFILL	Capillary Flow	Non-reworkable	LOCTITE® *ECCOBOND* E 1216M	*LOCTITE ECCOBOND* FP4526	*LOCTITE ECCOBOND* FP4531	*LOCTITE ECCOBOND* UF 1173
		Reworkable	*LOCTITE ECCOBOND* UF 3810	*LOCTITE ECCOBOND* UF 3812		
	Cornerbond	Reworkable	*LOCTITE* 3508NH			
PCB PROTECTION MATERIAL	Liquid Encapsulant	One-Component	*LOCTITE ECCOBOND* EN 3860T	*LOCTITE ECCOBOND* EN 3838T	*LOCTITE ECCOBOND* EO 1072	
		Two-Component	LOCTITE *ABLESTIK* FDA 2 BIPAX	*LOCTITE* EA 3450	*LOCTITE STYCAST* EE0079-HD0070	
		UV/Heat Cure	*LOCTITE ECCOBOND* UV 9060F			
	Overmold	Low Pressure Molding	*TECHNOMELT* PA 6208 N BLACK			
	Coating	Conformal Coating	*LOCTITE* SI 5293	*LOCTITE STYCAST* PC 40-UMF	*LOCTITE STYCAST* PC 62	*LOCTITE STYCAST* UV 7993
ELECTRICALLY CONDUCTIVE MATERIAL	Solder	Solder Paste	*LOCTITE* GC 3W	*LOCTITE* GC 10	*LOCTITE* HF 2W	*LOCTITE* LM 100
		Solder Flux	*LOCTITE* MF 210	*LOCTITE* MF 390HR		
		Solder Wire	*LOCTITE* C 400			
	Electrically Conductive Adhesive	One-Component Heat Cure	*LOCTITE ABLESTIK* 84-1 LMISR4	*LOCTITE ABLESTIK* CA 3556HF	*LOCTITE ABLESTIK* CE 3103WLV	*LOCTITE ABLESTIK* ICP 4000

GENERAL MEDICAL ASSEMBLY

Underfill

CAPILLARY FLOW

PRODUCT	DESCRIPTION	VISCOSITY	COEFFICIENT OF THERMAL EXPANSION, CTE (PPM/°C)		GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE SCHEDULE
			Below T_g	ABOVE T_g		
Non-reworkable						
LOCTITE® *ECCOBOND* E 1216M	Very fast flow and cure	4,000 cP at 20 rpm	35	131	125	3 min. at 165°C or 10 min. at 130°C
LOCTITE ECCOBOND FP4526	Capillary flow underfill for flip chip	4,700 cP at 10 rpm	33	101	133	15 min. at 165°C
LOCTITE ECCOBOND FP 4531	Capillary flow underfill for flip chip on flex applications	10,000 cP at 20 rpm	28	104	161	7 min. at 160°C
LOCTITE ECCOBOND UF 1173	Uniform void-free encapsulant underfill for CSP and BGA packages	7,500 cP at $10s^{-1}$	26	103	160	5 min. at 150°C
Reworkable						
LOCTITE ECCOBOND UF 3810	Reworkable capillary underfill	394 cP at $1,000s^{-1}$	55	171	102	8 min. at 130°C
LOCTITE ECCOBOND UF 3812	Reworkable capillary underfill with high T_g	350 cP at $1,000s^{-1}$	48	175	131	10 min. at 130°C

CORNERBOND

PRODUCT	DESCRIPTION	VISCOSITY	COEFFICIENT OF THERMAL EXPANSION, CTE (PPM/°C)		GLASS TRANSITION TEMPERATURE, T_g (°C)	CURE SCHEDULE
			Below T_g	ABOVE T_g		
Reworkable						
LOCTITE 3508NH	*Cornerbond* underfill designed to cure during Pb-free solder reflow	70,000 cP at $36s^{-1}$	65	175	118	Lead-free profile at 245°C

PCB Protection Material

LIQUID ENCAPSULANT

PRODUCT	DESCRIPTION	VISCOSITY		THIXOTROPIC INDEX
		Measurement	Test Method	
One-Component				
LOCTITE ECCOBOND EN 3860T	CSP/BGA encapsulant formulated to have low viscosity and good flow performance. Cures quickly at low temperatures to minimize thermal stress to other components and provide rapid device throughput.	1,000 cP at 1000 s^{-1}	Physical CP50-1	1.0 (2/20 rpm)
LOCTITE ECCOBOND EN 3838T	Flexible, low T_g material for encapsulating components on a circuit board. Material provides physical protection and stable electronic performance and protection in temperature/humidity/bias testing when cured.	6,700 cP at 2 rpm	Brookfield CP51	5.8 (2/20 rpm)
LOCTITE ECCOBOND EO 1072	Unique rheology allows the same product to be used as both a dam and fill encapsulant. For applications requiring excellent handling properties.	100,000 cP at 2 rpm	Brookfield Spindle 7	1.25 (2/20 rpm)

LIQUID ENCAPSULANT – CONTINUED

PRODUCT	DESCRIPTION	MIX RATIO	VISCOSITY (cP)	CURE SCHEDULE
Two-Component				
LOCTITE ABLESTIK FDA 2 BIPAX	Heat cure or Room temperature cure epoxy designed for medical device applications	100 : 100	14,000 at 10 rpm	24 hr. at 25°C or 1 – 4 hr. at 65°C
LOCTITE EA 3450	Two component epoxy adhesive	1 : 1	30,000 at 10 rpm	24 hr. at 25°C or 1 hr. at 80°C
LOCTITE STYCAST EE0079-HD0070	Two component epoxy adhesive	100 : 26	500 – 700 at 10 rpm	2 hr. at 60°C
UV/Heat Cure				
LOCTITE ECCOBOND UV 9060F	No flow, UV/moisture cure encapsulant	NA (1-component)	11,000 at 5 s^{-1}	25 sec. at 500 mW/cm2 (365 nm)

OVERMOLD

PRODUCT	DESCRIPTION	COLOR	OPERATING TEMPERATURE (°C)	SHORE HARDNESS	APPLICATION TEMPERATURE RANGE (°C)
Low Pressure Molding					
TECHNOMELT® PA 6208 N BLACK	Moldable polyamide with excellent adhesion to tough substrates. Great flexibility offers incredible strain relief on cables and wires. Ideal for encapsulation of heat-producing components in appliances and consumer electronics.	Black	-40 – 100	82A	180 – 230

COATING

PRODUCT	DESCRIPTION	VISCOSITY AT 25°C (cP)	VOLUME RESISTIVITY (Ω.cm at 25°C)	DIELECTRIC CONSTANT (1 MHz)	CURE SCHEDULE
Conformal Coating					
LOCTITE SI 5293	Repairable, solvent-free, medium-viscosity, UV/moisture-cure silicone, designed for severe temperature environments. High-reliability automotive applications.	400 – 800	1.0×10^{14}	4.5	20 sec. UV + 3 days at RT
LOCTITE STYCAST PC 40-UMF	Conformal coating specifically 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.	250 – 500	3.5×10^{16}	2.7	UV and moisture, 10 sec. UV + 3 days at RT
LOCTITE STYCAST PC 62	Conformal coating that provides environmental and mechanical protection. Toluene-free alternative with superior toughness and abrasion resistance.	52	1.04×10^{16}	2.2	24 hr. at 25°C or 45 min. at 75°C
LOCTITE STYCAST UV 7993	Conformal coating 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.	120	2.2×10^{16}	3.3	UV (150 – 300 mW/cm²) + Ambient Moisture (100 hr.)

GENERAL MEDICAL ASSEMBLY

Electrically Conductive Material

SOLDER

PRODUCT	DESCRIPTION	ALLOY	MELTING POINT (°C)	TYPICAL PROCESSING	PARTICLE SIZE	SHELF LIFE
Solder Paste						
LOCTITE® GC 3W	Pb-free, water wash, RoHS-compliant solder paste	SAC305	217	Stencil printing	Type 3, 4	6 months up to 26.5°C
LOCTITE GC 10	Room temperature, stable solder paste	SAC305	217	Stencil printing	Type 3, 4, 4.5 (4A), 5	12 months up to 26.5°C
LOCTITE LF 318	RoHS-compliant solder paste	90iSC, SAC305, SAC387	90iSC: 205 – 218 SAC305, SAC387: 217	Stencil printing	Type 3, 4	6 months at 0 – 10°C
LOCTITE LM 100	Low melting alloy for sensitive substrates	BI58	138	Dispensing and stencil printing	Type 2.5 (2A)	6 months at 0 – 10°C

PRODUCT	DESCRIPTION	SOLID CONTENT (%w)	ACID VALUE (mg KOH/g)	TYPICAL PROCESSING	IPC J-STD-004B CLASSIFICATION
Solder Flux					
LOCTITE MF 210	Resin-free flux designed to solder onto surfaces known to have poor solderability.	2.9	22.5	Spray/Foam	ORM0
LOCTITE MF 390HR	Liquid flux designed for exceptional through-hole fill and recommended for general electrical soldering applications.	6.0	20 – 25	Spray/Foam	ROL0

SOLDER – CONTINUED

PRODUCT	DESCRIPTION	APPROXIMATE FLUX CONTENT (% BY WEIGHT)	DIAMETER RANGE (mm)	ALLOY PB-FREE	ALLOY SnPb	IPC J-STD-004B CLASSIFICATION
Solder Wire						
LOCTITE C 400	Clear residue, cored solder wire with increased flux content for improved wetting on challenging surfaces.	2.2	0.38 – 1.63	90iSC, 99C, SAC 305, SAC 387	Sn60, Sn62, Sn63	ROL0

ELECTRICALLY CONDUCTIVE ADHESIVE

PRODUCT	DESCRIPTION	VOLUME RESISTIVITY (Ω.cm)	TYPICAL PROCESSING	STORAGE MODULUS AT 25°C (MPa)	CURING SCHEDULE
One-Component, Heat Cure					
LOCTITE ABLESTIK 84-1 LMISR4	Electrically conductive die attach adhesive	≤ 0.0002	Dispensing	3,900	1 hr. at 175°C
LOCTITE ABLESTIK CA 3556HF	Acrylic ECA, flexible material	0.0025	Dispensing	650	10 min. at 120°C
LOCTITE ABLESTIK CE 3103WLV	Electrically conductive epoxy adhesive that is a Pb-free alternative to solder	0.0008	Dispensing	4,500	10 min. at 120°C
LOCTITE ABLESTIK ICP 4000	Silicone based, electrically conductive adhesive. Specially designed for applications where both high flexibility and excellent conductivity are required.	0.00006	Dispensing or pin transfer	< 100	60 min. at 130°C

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