



# MATERIAL SOLUTIONS FOR EV CHARGING INFRASTRUCTURE

*Formulated for Continuous Performance and Sustainable Results*



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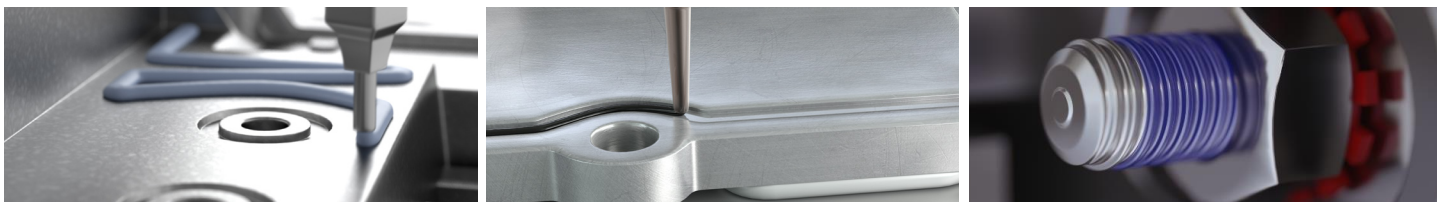
## Introduction



An expansive EV charging infrastructure is vital for the continued growth of the electric vehicle market. Often located in outdoor environments with long lifetime expectations, chargers of all types – from residential single-phase up to DC fast chargers – provide safe charging while protecting EV battery packs from electrical and/or thermal events.

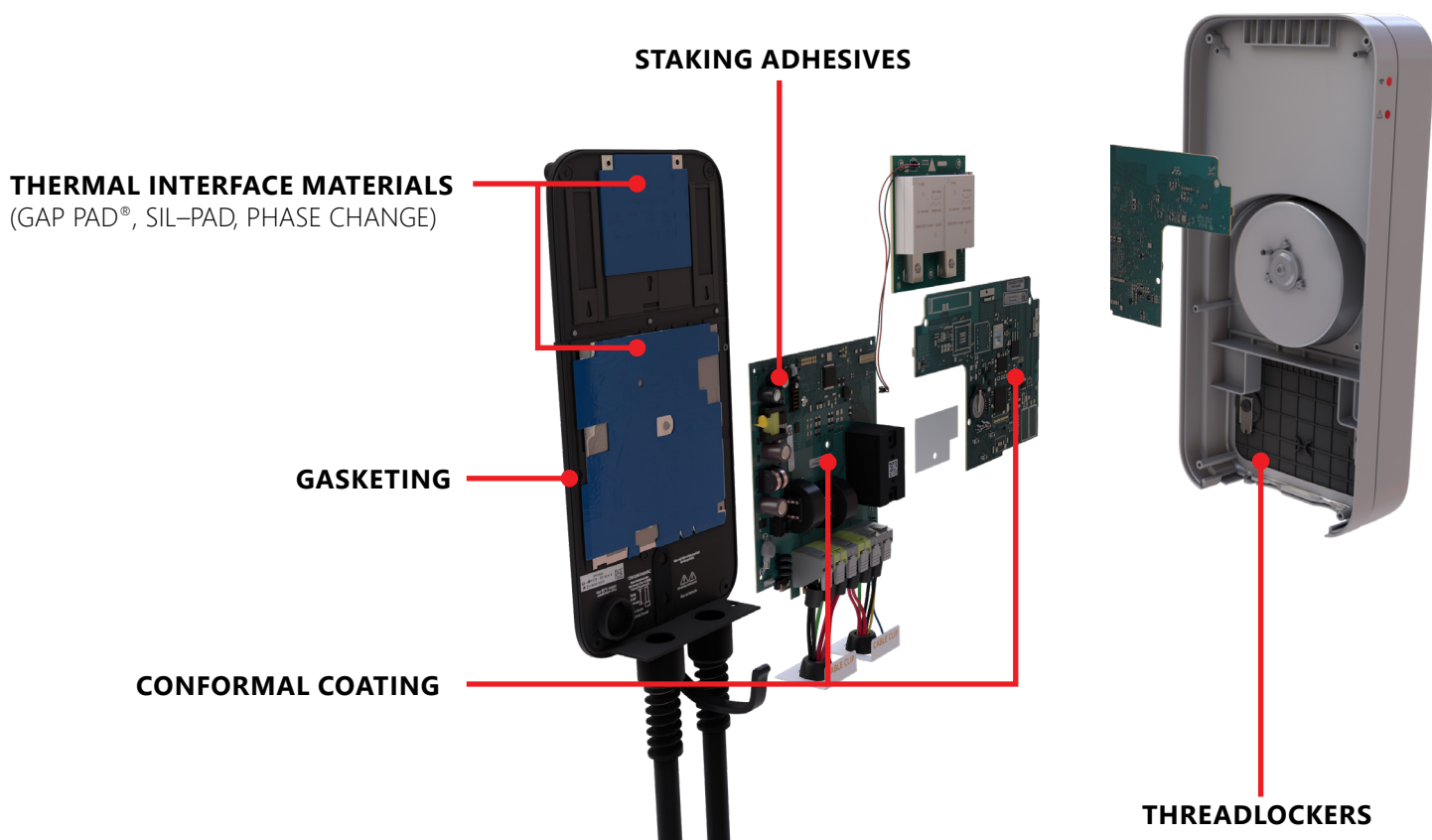
# Application Overview

Within these devices, Henkel materials deliver operational stability and performance consistency. Gasketing and protection solutions safeguard electronics against elemental exposure and contaminants; thermal interface materials improve power conversion efficiency and reliability; potting formulations deliver toughness through encapsulation and protection of connectors; and adhesives offer manufacturing productivity improvements and parts-securing strength in-application. Together, these solutions will help deliver EV charging dependability that inspires consumer confidence.



## AC Single Phase Charging Stations

### Material Solutions



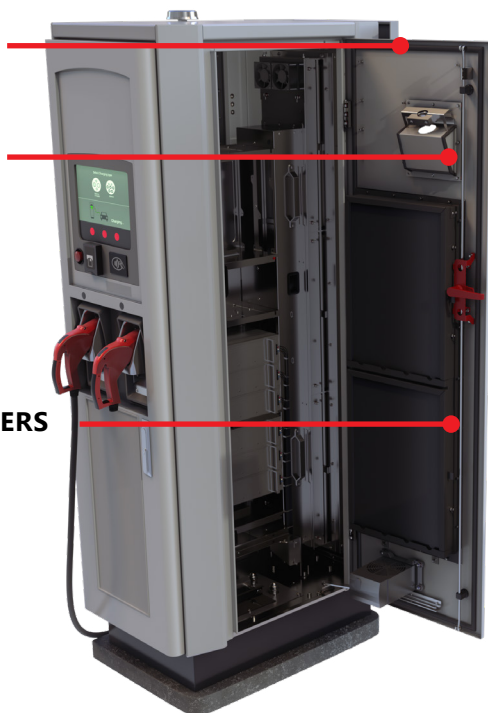
# DC Fast/Ultra-Fast Charging Stations

## Material Solutions

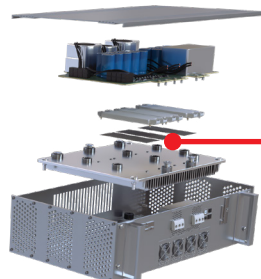
**GASKETING**

**SEALANTS**

**THREADLOCKERS**

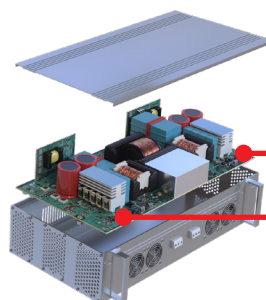


Power Module System



**PHASE CHANGE MATERIAL**

Discrete Component System

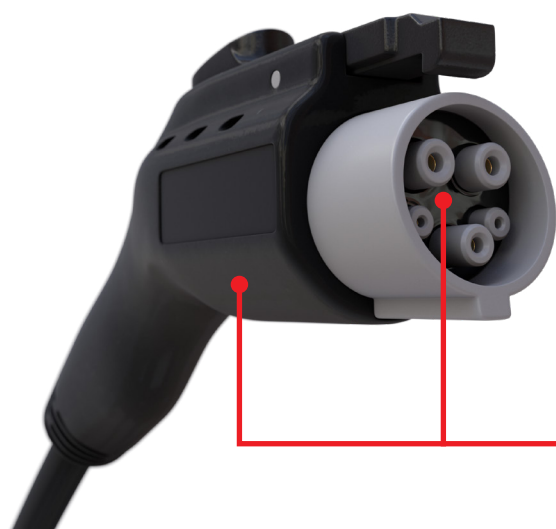


**CONFORMAL COATING**

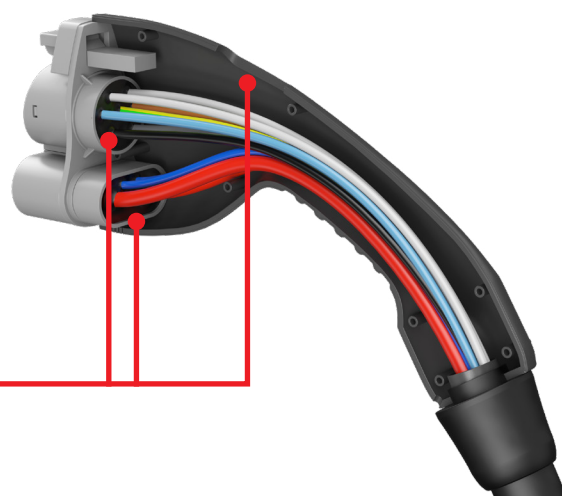
**THERMAL INTERFACE MATERIALS**  
(GAP PAD®, SIL-PAD, PHASE CHANGE)

# Charging Connectors

## Material Solutions

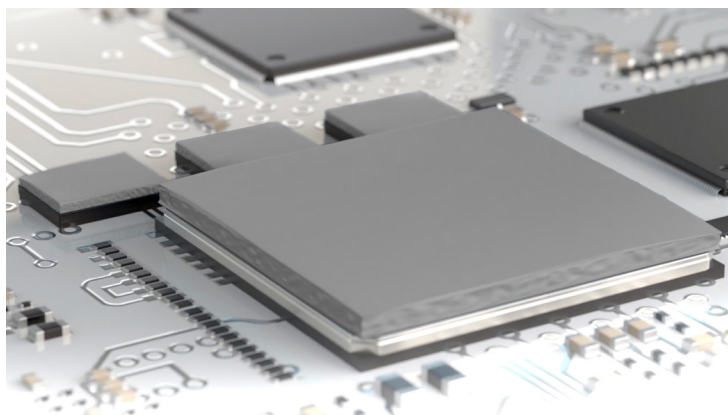


**POTTING**



# Thermal Solutions for EV Chargers

## Thermal Management



With voltage ratings as high as 500 V for DC fast chargers and up to 800 V for ultra-fast chargers, dissipating heat from power switching components and providing safety agency-recognized insulation is mission-critical for reliable operation.

## 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 HC3000	High compliance, silicone GAP PAD®	3	110	5,000	0.508 – 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 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 3000SF	Two-part, silicone-free gap filler	3.0	18 (High Shear) at 1500/s	250	12 hr. at 25°C or 6 hr. at 85°C	UL 94 V-0
BERGQUIST® GAP FILLER TGF 4500CVO	Two-part, silicone, controlled volatility gap filler	4.5	20 (High Shear) at 1500/s	250	48 hr. at 25°C or 30 min. at 85°C	UL 94 V-0

## Phase Change

Product Name	Description	Phase Change Temperature	Thermal Resistance (°C in <sub>2</sub> /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 <sup>12</sup>	5,000	0.102 – 0.127

## Phase Change – Continued

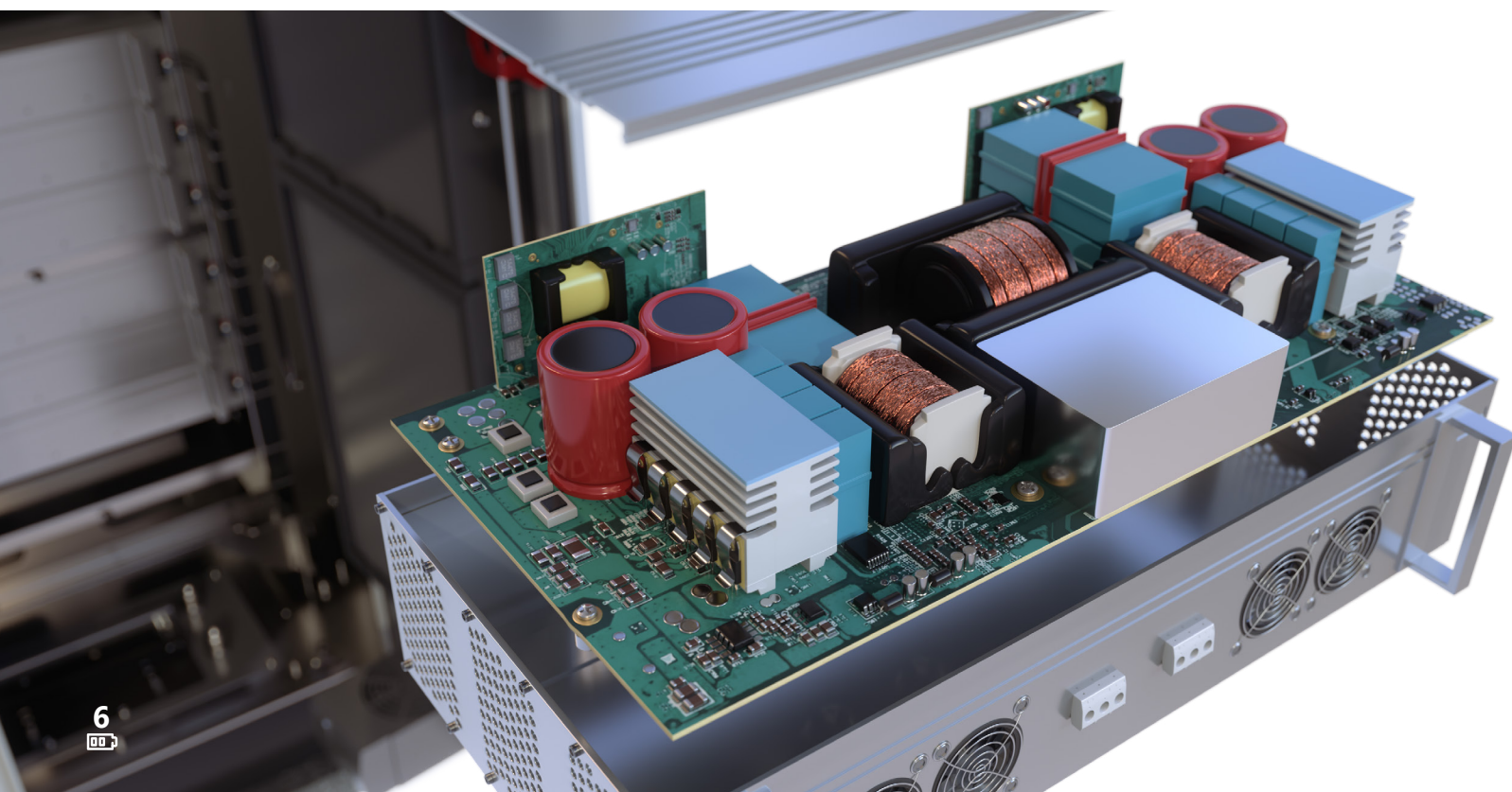
Product Name	Description	Phase Change Temperature (°C)	Thermal Conductivity (W/m·K)	Specific Gravity	Recommended Drying Condition	Application Method
LOCTITE® TCP 4000 D	A reworkable, repeatable and dispensable phase change thermal interface material suitable for use between a heat sink and a variety 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

## Thermally Conductive Insulating Films (SIL-PAD, HI FLOW)

Product Name	Description	Phase Change Temperature	Thermal Resistance (°C in <sub>2</sub> /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 <sup>12</sup>	5,000	0.004 – 0.005

Product Name	Description	Thermal Conductivity (W/m·K)	Viscosity (Pa·s)	Dielectric Strength (V/mil)	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 1600S	Fiberglass reinforced SIL-PAD	1.6	92	5,500	0.229	UL 94 V-0
BERGQUIST® SIL-PAD TSP 4000*	Fiberglass reinforced SIL-PAD	4.0	–	6,000	0.2, 0.25, 0.375, 0.5	UL 94 V-0

\* product launch scheduled – Q2 2022



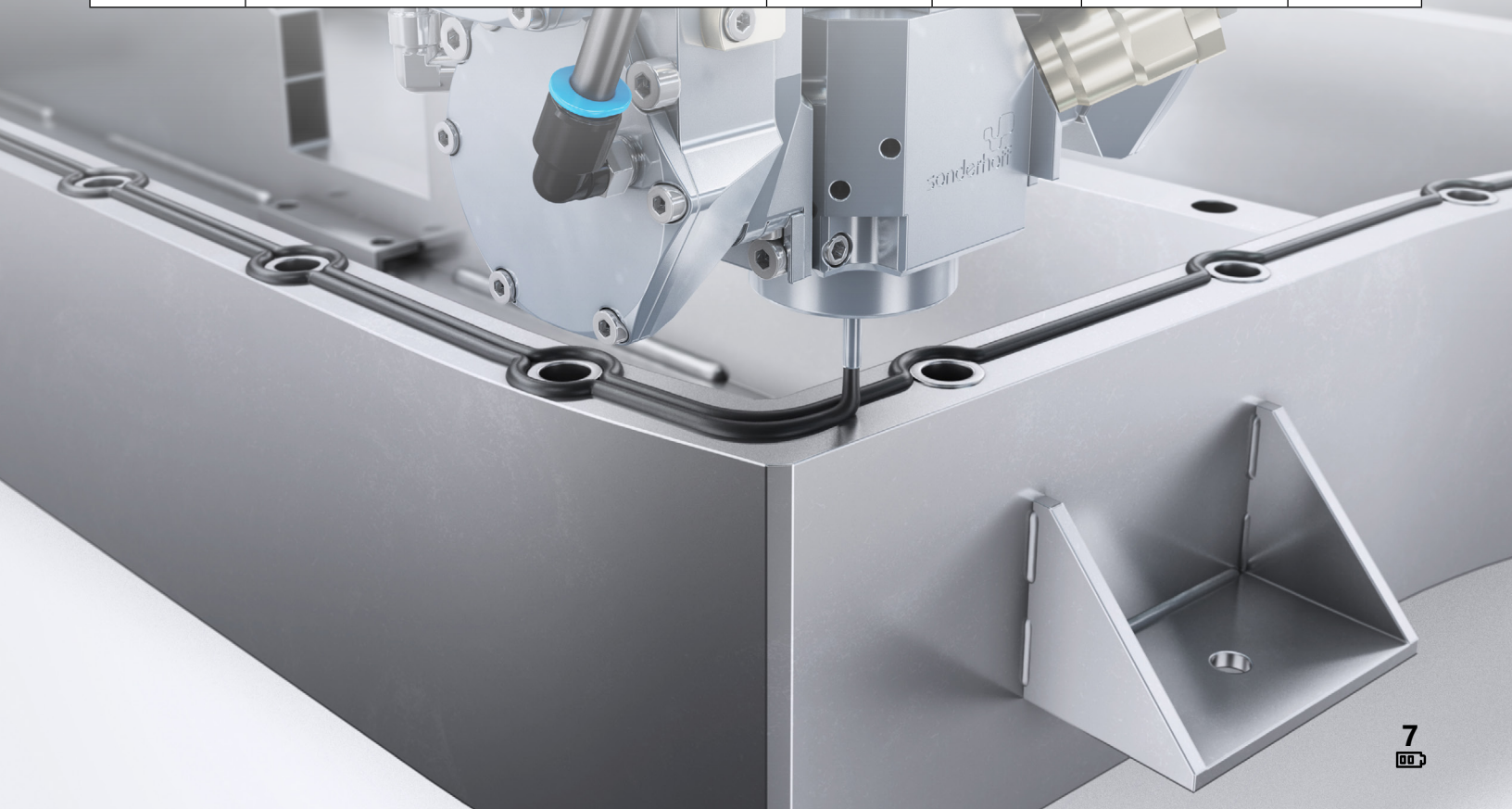
# Protecting Solutions for EV Chargers

## Gasketing/Sealing

Formed-in-place-foam-gasketing (FIPFG) and sealing products are automation-friendly formulations that allow simple deposition and easy modification for different enclosure geometries. Adhesion to multiple surfaces, adaptable curing mechanisms and an environmental compatibility range from -55° C up to 150° C help charger designers meet high-volume device processing and in-application protection metrics.

Product Name	Description	Flame Retardancy	Water Absorption	Compression Load Deflection	Temperature Resistance	Compression Set (DVR)
SONDERHOFF 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
SONDERHOFF 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 electronics 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



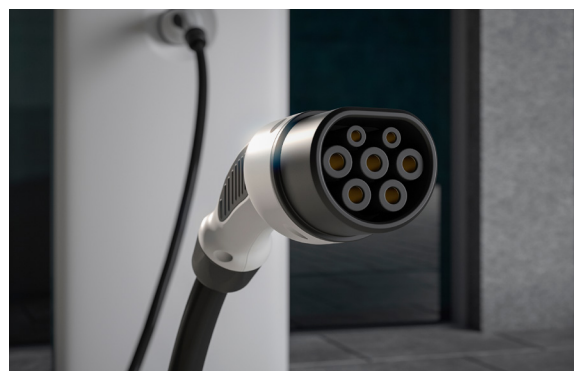
# Conformal Coating

Henkel conformal coatings ensure electronic operational integrity by defending electronic circuits from thermal shock, dust, moisture and dynamic environmental conditions. Simple to apply and process, these SVHC, solventless, tin-free formulas are UV and moisture cure-capable for optimized sustainable protection.

Product Name	Description	Technology	Cure Schedule	Viscosity 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 UV 7993	Designed to provide rugged protection from moisture and harsh chemicals. It is compatible with industry standard solder masks, no-clean fluxes, metalization, components and substrate materials	Urethane	10 – 20 sec. at 150 – 300 mW/cm² [UV365nm] + 100 hr. at RT/50% RH or 50 hr. at RT / > 70% RH	120	-40 – 130°C

# Potting

UL-certified potting materials allow simple integration into mass production operations, providing fast curing, easy dispensing and gel time adaptability. Stable over a wide temperature and humidity range with high elongation to break, Henkel potting solutions offer tough protection and excellent dielectric properties to enable safe high-voltage operation.



Product Name	Description	Viscosity (A) mPas	Hardness Shore 00	Density g/cm³	Flame Rating
SONDERHOFF FERMADUR A-113	Two-component polyurethane potting compounds Flexible, levels very well, low shrinkage, low surface tension	ca. 1.000	A45 – A55	1,15	UL 94 V-0
SONDERHOFF FERMADUR A-125	Two-component polyurethane potting compounds Flexible potting compound, low shrinkage, low surface tension	ca. 1.500	A65 – A75	1, 20	UL 94 V-0
SONDERHOFF FERMADUR A-173	Two-component polyurethane potting compounds Slightly foaming, flexible, high longitudinal water tightness achievable	ca. 1.000	A50	0,80	UL 94 V-0

Product Name	Description	Technology	Cure Schedule	Density g/cm³	Working Life	Shore Hardness	Flammability Rating
Polyurethane - Two Part							
LOCTITE® STYCAST US 1000*	General purpose polyurethane potting material	Polyurethane	2 hr. at 65°C or 48 hr. at 25°C or 1 hr. at 80°C	17,500	4 – 8 min. for 100 g mass at 25°C	88A	–
LOCTITE® STYCAST US 1000 EP*	Extended pot life polyurethane potting material	Polyurethane	2 hr. at 65°C or 48 hr. at 25°C or 1 hr. at 80°C	17,500	20 – 30 min. for 100 g mass at 25°C	85A	–

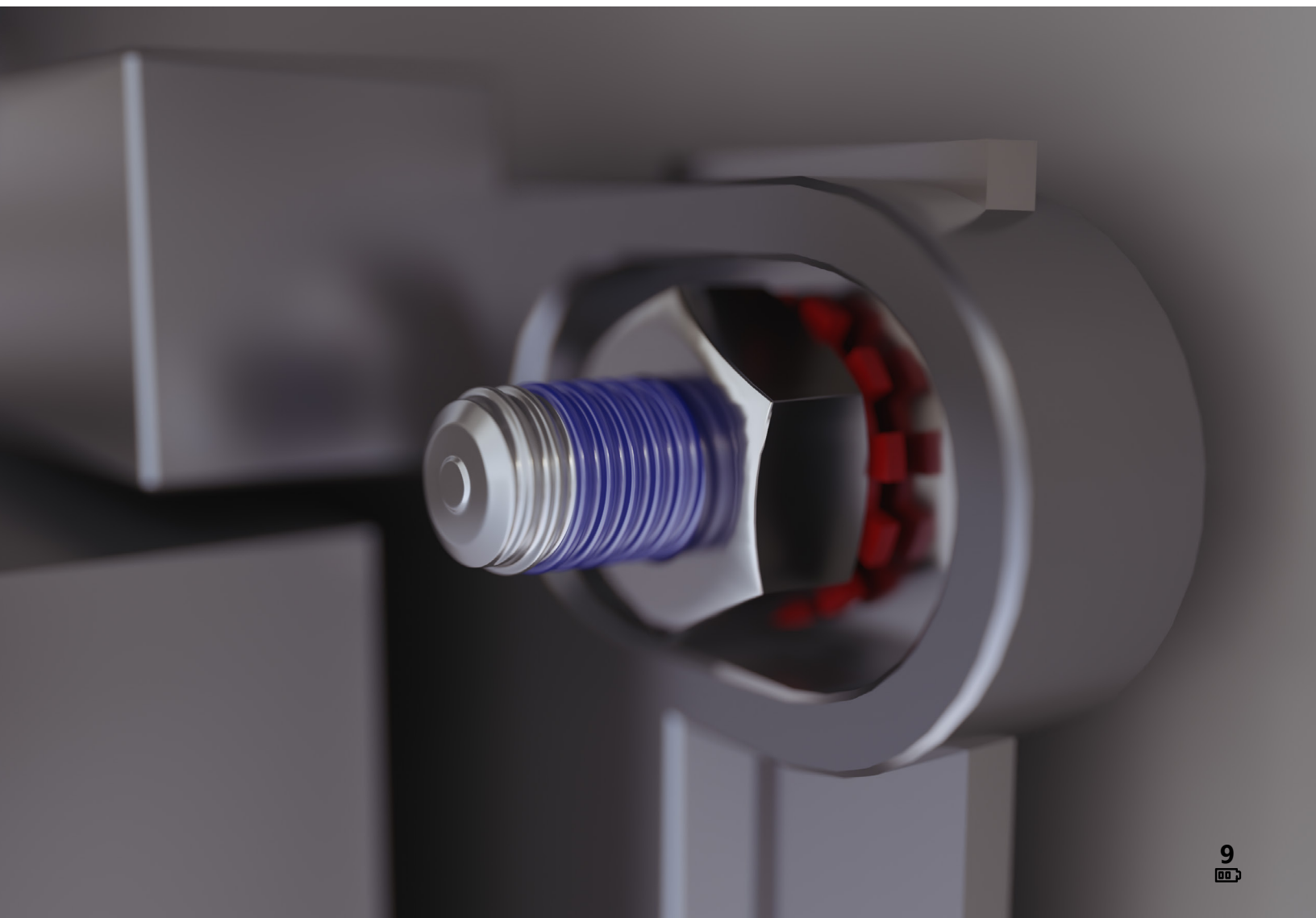
\* product launch scheduled – Q1 2022

# Bonding Solutions for EV Chargers

## Threadlocker

Market-leading LOCTITE® brand threadlockers secure and seal threaded fasteners, but also allow disassembly when needed. Ideal for EV charging devices, threadlockers prevent vibration-induced loosening, seal out fluids and corrosion, and keep bolts, nuts and studs firmly in place.

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	–





## Staking Adhesives

Used wherever enhanced physical strength is required, such as around large components like capacitors, Henkel staking adhesives offer additional support. Resistant to fluids, salts and alkalis, they perform well under extreme environmental conditions to ensure long-term reliability.

## Assembly Adhesives

Product Name	Description	Chemistry	Viscosity (cP)	Volume Resistivity ( $\Omega \cdot \text{cm}$ at 25°C)	Application	Cure Schedule
<b>Acrylic</b>						
LOCTITE® AA 3103	Cures rapidly to form flexible, transparent bonds when exposed to ultraviolet light and/or visible light of sufficient radiance 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/cm <sup>2</sup> at 5 sec.
<b>Epoxy</b>						
LOCTITE® ABLESTIK 2151	Thixotropix, two-part adhesive that develops strong, durable high-impact bonds at room temperature, improving heat transfer while maintaining electrical insulation	Epoxy	40,000	$2.10 \times 10^{15}$	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	$6.00 \times 10^{15}$	Assembly Adhesive	1 hr. at 120°C

## Chipbonder

Product Name	Description	Chemistry	Viscosity (cP)	Glass Transition Temperature, T <sub>g</sub> (°C)	Cure Schedule
<b>Epoxy</b>					
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 dot profile, high wet strength and good electrical characteristics are required. The product is also suitable for stencil print applications	Epoxy	35,000 (Casson)	105	2 min. at 150°C

# PIONEERS AT HEART

FOR THE GOOD OF GENERATIONS

It all started with a dream. 145 years ago, Fritz Henkel, an entrepreneur, and courageous pioneer at heart revolutionized the everyday life of people. With that, he launched a legacy of care: for his employees, society, and environment. Long before the concept existed, he put sustainability first.

Today, the name Henkel still stands for these values. Our sense of unity has made us a diverse community of over 52,000 that customers and consumers put their trust in. Together, we enrich and improve the lives of billions every day through our products, services, and solutions. And we have the potential to impact even more.

We will build on our pioneering spirit, knowledge, and resources to shape a purposeful future for the next generations. With our innovation and technology, we create value for customers and consumers, bring success to our teams, and are a force for good in the world.

**WE ARE PIONEERS AT  
HEART FOR THE GOOD OF  
GENERATIONS.**



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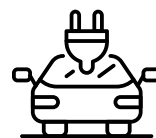
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Around the Globe.**



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