

LOCTITE®
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HENKEL SOLUTIONS FOR E-MOBILITY

BATTERY SYSTEMS, POWER CONVERSION SYSTEMS AND E-DRIVE SYSTEMS



Henkel



OUR AIM IS TO THOROUGHLY UNDERSTAND OUR CUSTOMERS' CHALLENGES AND NEEDS...

BATTERY SYSTEMS

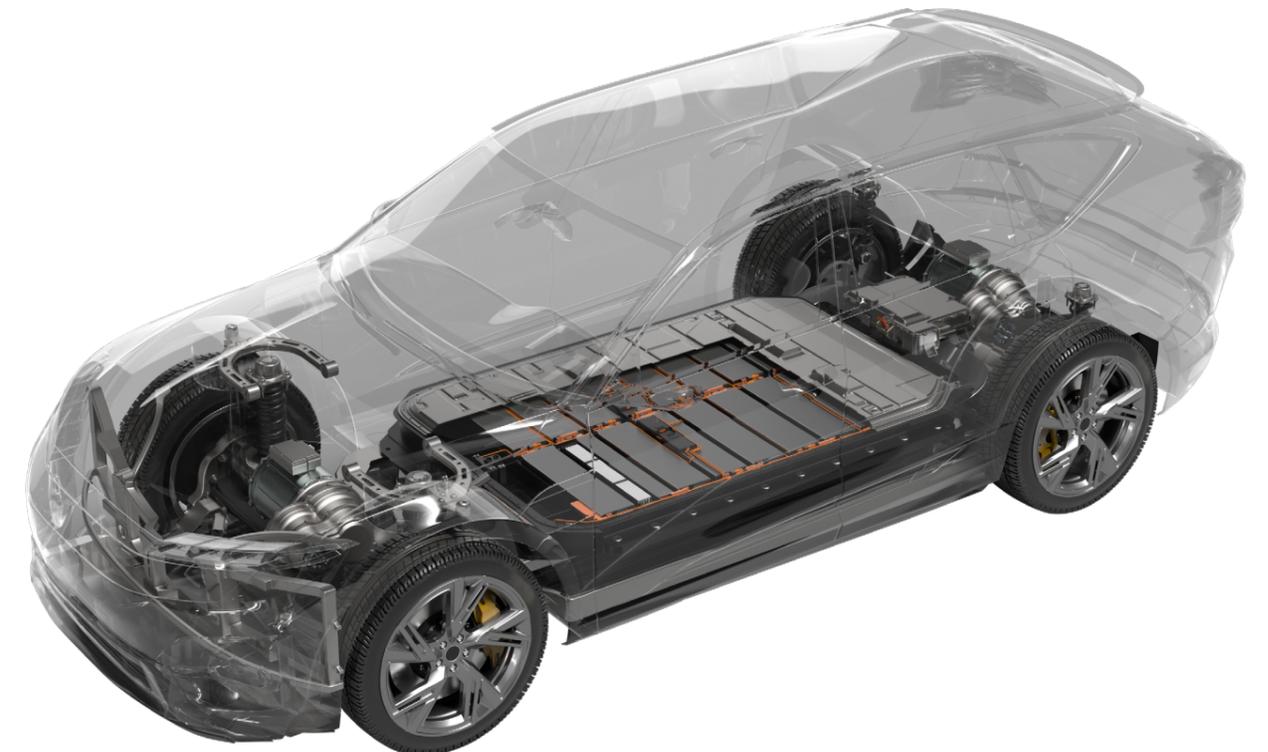
Battery systems are one of the most critical components of an electric vehicle (EV), accounting for approximately 20 – 30% of the vehicle's weight and up to 50% of its total cost. Key considerations for battery design include cost efficiency, thermal management, passenger safety, and circularity. These factors make efficient and secure component assembly—as well as effective thermal management—top priorities in battery system engineering and design.

POWER CONVERSION SYSTEMS

Power conversion systems are sophisticated electronic components that manage high-voltage DC and AC currents under harsh electrical and environmental conditions. Effective sealing, electrical insulation, and thermal management are critical to protect sensitive electronics, ensuring system efficiency, safety, and long-term reliability across the electric vehicle's lifespan.

E-DRIVE SYSTEMS

Electric motors in EVs are regularly exposed to mechanical vibration, thermal cycling, and challenging environmental conditions. As one of the few systems with moving parts, ensuring structural integrity, reliable sealing, and effective thermal management is essential for maintaining consistent performance and durability.



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INNOVATING FOR ZERO-EMISSION MOBILITY



We are committed to solving the engineering and commercial challenges through a combination of:

BROAD TECHNOLOGY PORTFOLIO

We have a market leading position in thermal interface materials, adhesives, sealants and functional coatings. In addition, we support our customers overcome engineering challenges by leveraging our strong R&D competences to develop customized solutions.

PROCESS EXPERTISE

With over 60 years of experience in the automotive industry, our global team of solution engineers has an unparalleled application and process understanding. Our team offers dedicated support to co-develop sustainable production processes that meet large-scale manufacturing requirements.

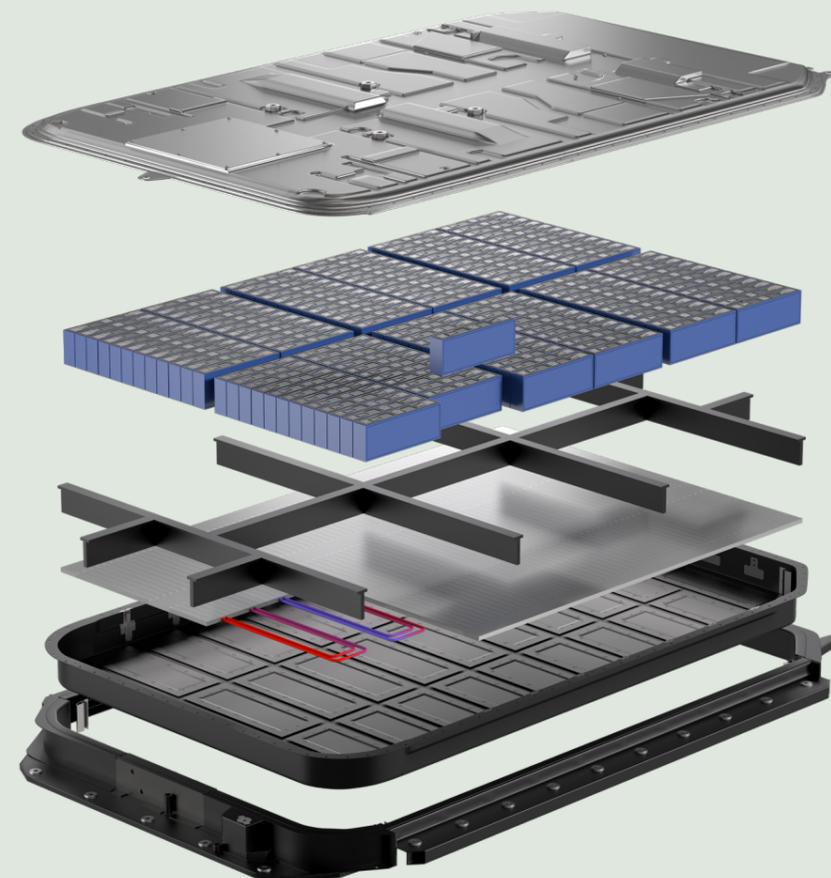
EQUIPMENT SUPPORT

In addition to offering specialized dispensing equipment from Sonderhoff, we also partner with a global network of leading dispensing equipment suppliers, with which we collaborate to support our customer projects. Moreover, our labs are equipped with the latest technology and equipment for modeling, simulation and mechanical validation.



HENKEL SOLUTIONS FOR EV BATTERY SYSTEMS

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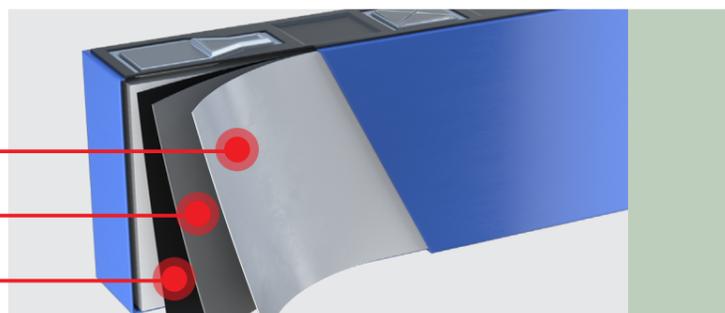


DISCOVER OUR PORTFOLIO FOR EV BATTERY SYSTEMS

Current collector foil

Henkel's battery conductive coating

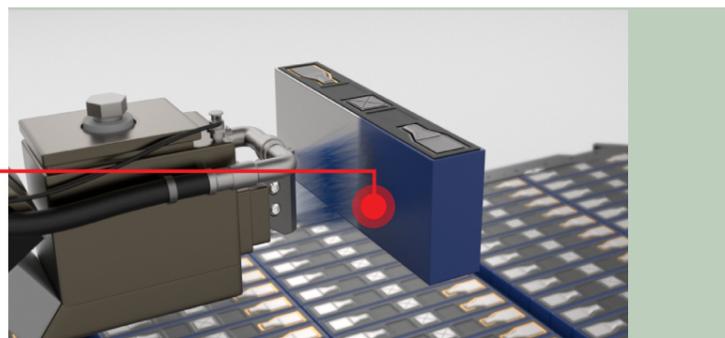
Battery active material



BATTERY CONDUCTIVE COATINGS

Product	Carrier	Viscosity	Sheet Resistance	Key properties
BONDERITE® B-CC 1020	Water	50 – 500 mPa·s	< 50 Ω/sq at 25 μm	Conductive coating developed for lithium-ion battery dry coating process providing adhesion of electrode materials to the current collector.
BONDERITE® B-CC 2200	Water	50 – 500 mPa·s	< 50 Ω/sq at 25 μm	Conductive coating developed for lithium-ion battery applications providing adhesion of electrode materials to the cathode.

Dielectric coating application on a battery cell casing



DIELECTRIC COATINGS

Product	Technology	Dielectric Strength	Lap Shear & Tensile Strength	Key properties
BONDERITE® B-DC 5100	UV Acrylate	> 90 kV/mm	> 10 MPa	Thin dielectric coating with enhanced thermal conductivity and low thermal impedance for electrical insulation in battery cells and cooling plates.

Thermally conductive adhesives applied between the battery cells and the cooling plate



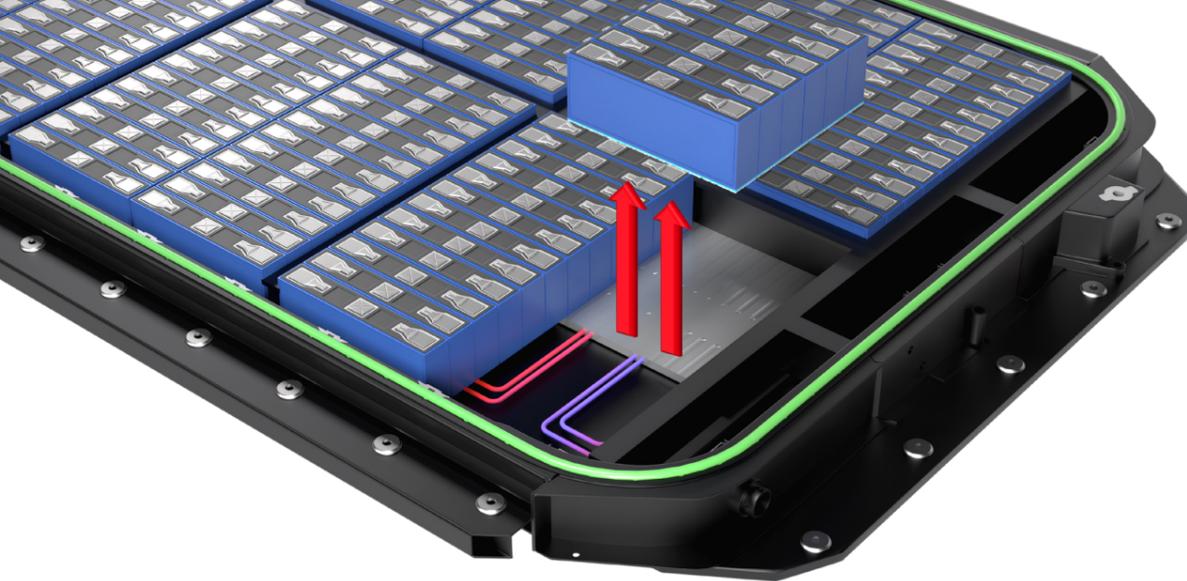
THERMAL INTERFACE MATERIALS

Product	Chemistry	Curing	Thermal conductivity	Key properties
BERGQUIST® TGF 2010 APS	Silane-modified polymer	RT or heat	2.1 W/mK	Non-silicone gap filler, high dispense rate (>40 cc/sec).
BERGQUIST® TGF 3015 APS	Silane-modified polymer	RT or heat	3.0 W/mK	Non-silicone gap filler, high dispense rate (> 40 cc/sec).
BERGQUIST® TGF 2025 APS	Silane-modified polymer	RT or heat	2.0 W/mK	Non-silicone gap filler, high dispense rate (> 40 cc/sec) designed for ultra-low compression force.
BERGQUIST® TGF 2200 APS	Silicone	RT or heat	2.2 W/mK	Low density gap filler, UL94 V0, compressible (shore OO 55).
<u>BERGQUIST® TGP 1350</u>	Silicone	Pre-cured	1.3 W/mK	GAP PAD®, compressible (shore OO 30), UL94 V0, high durability.
LOCTITE® EA 9497	Epoxy	RT	1.4 W/mK	Thermally conductive adhesive, high stiffness and strength, multi-substrate bonding.
LOCTITE® TLB 9150	Polyurethane	RT or heat	1.3 W/mK	Thermally conductive adhesive, high dispense rate, solvent free, long open time and fast adhesion build.
LOCTITE® TLB 9200 APS	Polyurethane	RT or heat	2.0 W/mK	Thermally conductive adhesive for bonding battery cells or modules. Two-component, moderate viscosity, excellent electrical isolation and mid-range thermal conductivity.
<u>LOCTITE® TLB 9300 APSi</u>	Polyurethane	RT or heat	3.1 W/mK	Thermally conductive adhesive for bonding battery cells or modules. Two-component, moderate viscosity, excellent electrical isolation, high thermal conductivity and bonding strength.

RT = Room temperature curing

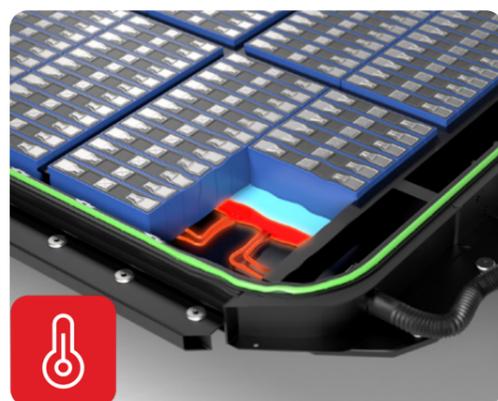
BATTERY SAFETY MATERIALS

Product	Chemistry	Curing	Thermal conductivity	Key properties
LOCTITE® BSX 5200	Silicone	RT	0.32 W/mK	Battery safety potting for cell contact, vent protection, and thermal propagation prevention.
LOCTITE® BSC NEXT-GEN	Not published	RT	< 0.5 W/mK	Battery safety coating, providing heat stability, mechanical strength, and electrical insulation.



ENABLING CIRCULARITY WITH **DEBONDABLE BATTERY ADHESIVES**

Henkel is pioneering a new generation of battery adhesives designed for debonding at end-of-life. These solutions support circularity by enabling easier battery pack repair, reuse, and recycling—without compromising structural integrity during use.



THERMAL TRIGGER

Debonding is activated by applying heat, which causes the adhesive's polymer structure to soften, expand, or decompose in a controlled way. This reduces adhesion strength and allows bonded parts—such as cells, covers, or modules—to be separated without damage. Ideal for disassembly processes that involve uniform heating.



ELECTRICAL TRIGGER (ELECTRICAL DELAMINATION)

Debonding is initiated using an electrical current that creates a weak boundary layer within the adhesive interface. This leads to interfacial accumulation and separation, allowing bonded components to delaminate cleanly. The process enables selective, localized disassembly without the need for external heat or mechanical force.

BATTERY ASSEMBLY & STRUCTURAL ADHESIVES

Product	Chemistry	Curing / Initial Strength	Bond Strength / Shear Strength (psi)	Key properties
TEROSON® MS 9399	Silane-modified polymer	Room temperature cure after mixing / 10 min at 60°C Handling time: 2 hr at room temperature cure	290	Non-silicone, NCO-free, solvent-free, good adhesion to multiple substrates, high elasticity.
LOCTITE® AA 3963	Acrylic	UV / Visible light / ≤ 10 sec	3,336	Quick cure, high strength, flexible open time.
TEROSON® EP 5065	Epoxy	Room temperature cure / 15 min at 80°C Handling time: 8 hr at 23°C	3,625	Adhesion to multiple substrates, crash resistance.
TECHNOMELT® PS 1573E	Synthetic-rubber	Room temperature cure / fast cure, sec to min	52	Pressure-sensitive adhesive.
LOCTITE® AA 3525	Acrylic	UV / Visible light / < 30 sec	1,420	Quick cure, easy to handle, flexible open time.
LOCTITE® AA H8000	Acrylic	Room temperature cure / 30 min	3,140	Flexible open time, good adhesion to multiple substrates.
TEROSON® PU 6700ME/6800	Polyurethane	Room temperature cure / 120 min	1,450	Improves system overall stiffness (e-modulus > 500MPa), compatible with spot welding, Micro-Emission PU (label free).
LOCTITE® UK 2015	Polyurethane	Room temperature cure after mixing / 10 min at 20°C	2,900	Provides incremental stiffness, excellent adhesion to non-metallic surfaces.
LOCTITE® UK 2018	Polyurethane	Room temperature cure / 4 – 5 min	1,740	Fast strength build-up; designed for structural bonding in battery module and cell assembly. UL94 V0 rated.

DISCOVER OUR PORTFOLIO FOR EV BATTERY SYSTEMS

Gasketing for battery pack housings



Henkel's surface treatment solutions for EV systems are globally available. BONDERITE® products are specified by major OEMs and are typically available in 25 kg, 200 kg or 1000 kg packaging sizes.

GASKETING

Product	Chemistry	Curing	Serviceability	Flame retardancy (UL94 V0)	Key properties
LOCTITE® SI 5486	Silicone foam	FIPFG	Yes	Yes	Low compression set with excellent sealing and aging performance, exceeds UL94 V0.
LOCTITE® SI 5970	Silicone	RTV / FIPG	Yes	Yes	High performance silicone gasket, MEKO-free, UL94 V0, high elongation to withstand joint movement, low volatility.
TEROSON® MS 939 FR	Silane-modified polymer	RTV / FIPG	Yes*	No	Good moisture barrier, good elongation.
LOCTITE® ESB 5100	Butyl	Non-reactive	Yes	No	Non-curing, permanent tacky, pumpable.
TEROSON® MS 9320 SF	Silane-modified polymer	RTV / FIPG	No	No	Non-silicone, sprayable, low viscosity, weld sealant.
TEROSON® MS 930	Silane-modified polymer	RTV / FIPG	Yes*	No (only UL94 HB)	High viscosity, weld sealant, non-silicone, paintable.
SONDERHOFF FERMAPOR K31 SERIES	Polyurethane foam	RTV / FIPFG	Yes	No	Customizable, compressible, fast-cure, tolerance adaptable, complete system solution with dosing equipment.
SONDERHOFF FERMASIL SERIES	Silicone foam	RTV / FIPFG	Yes	No	Customizable, compressible, water-resistant, tolerance adaptable, complete system solution with dosing equipment.

FIPG = Formed-in-place gasket, CIPG = Cured-in-place gasket, RTV = Room-temperature-vulcanizing *Tools required

SURFACE TREATMENT

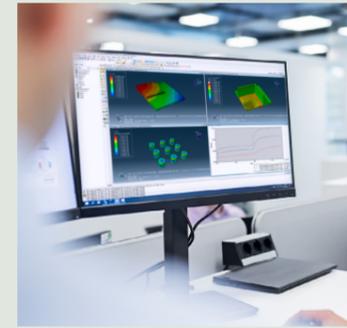
Tailor-made products for cell cases, battery modules, cooling plates, battery packs

Components	Henkel Solutions	Benefits
Battery Pack & Module	• Mild, non-etching aluminum cleaners	• Clean and homogeneous surfaces, does not impact surface appearance
	• Single stage etch-passivation as welding promoter	• Stable surface resistance • Improves first pass rate of welding operations
	• Pretreatment and conversion coatings for painting processes	• For excellent paint adhesion and corrosion performance
Cooling Plate	• Alkaline cleaners, etchants and conversion coatings	• Removes residues from forming or brazing processes • Clean and homogeneous surfaces for power paint or e-coat • Provides excellent paint adhesion and corrosion resistance
Cylindrical Cell	• Lubricants, cleaners and coatings for Ni-coated cylindrical cells	• High production speed, clean surfaces and corrosion protection
Prismatic Cell	• Lubricants, cleaners and coatings for Aluminum prismatic cells	• High production efficiency, remove particles and forming residues, corrosion protection

BATTERY MODELING AND SIMULATION

ACCELERATING BATTERY INNOVATION WITH MODELING AND SIMULATION

Henkel supports OEMs and battery manufacturers with optimizing EV battery design by offering advanced modeling, simulation, and testing solutions. By engaging early in the design phase, Henkel enables informed material selection and reduces development time and costs—ensuring high-performance, safe, and sustainable battery systems. Our deep automotive expertise, AI-generated virtual adhesives, and physical validation capabilities make Henkel a trusted innovation and engineering partner in the shift toward e-mobility.



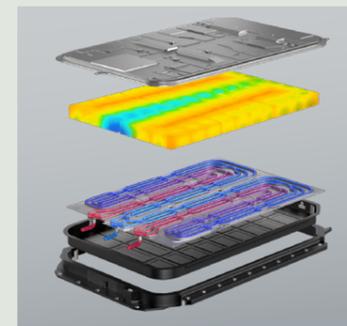
COMPREHENSIVE MATERIAL DATA CARDS FOR ADVANCED BATTERY DESIGN

Henkel provides detailed material cards with mechanical, thermal, and rheological data to help engineers accurately simulate battery behavior. These datasets enable predictive modeling of energy density, thermal management, and structural integrity across different load cases and operating conditions.



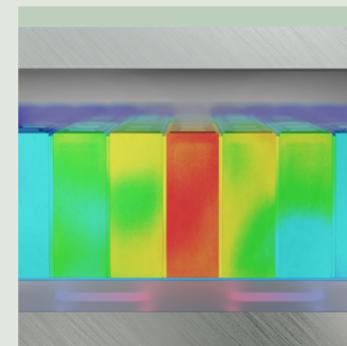
BATTERY STRUCTURAL SIMULATION

Simulations evaluate the mechanical performance of materials under impact, crush, and vibration scenarios. By identifying failure points and optimizing material properties, Henkel supports the development of safer and more robust battery pack designs.



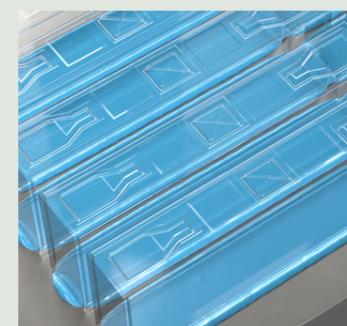
BATTERY THERMAL SIMULATION

Henkel's thermal models assess how materials manage heat during fast charging, acceleration, and extreme temperatures. These insights guide the selection of thermal interface materials to prevent overheating and improve system efficiency and safety.



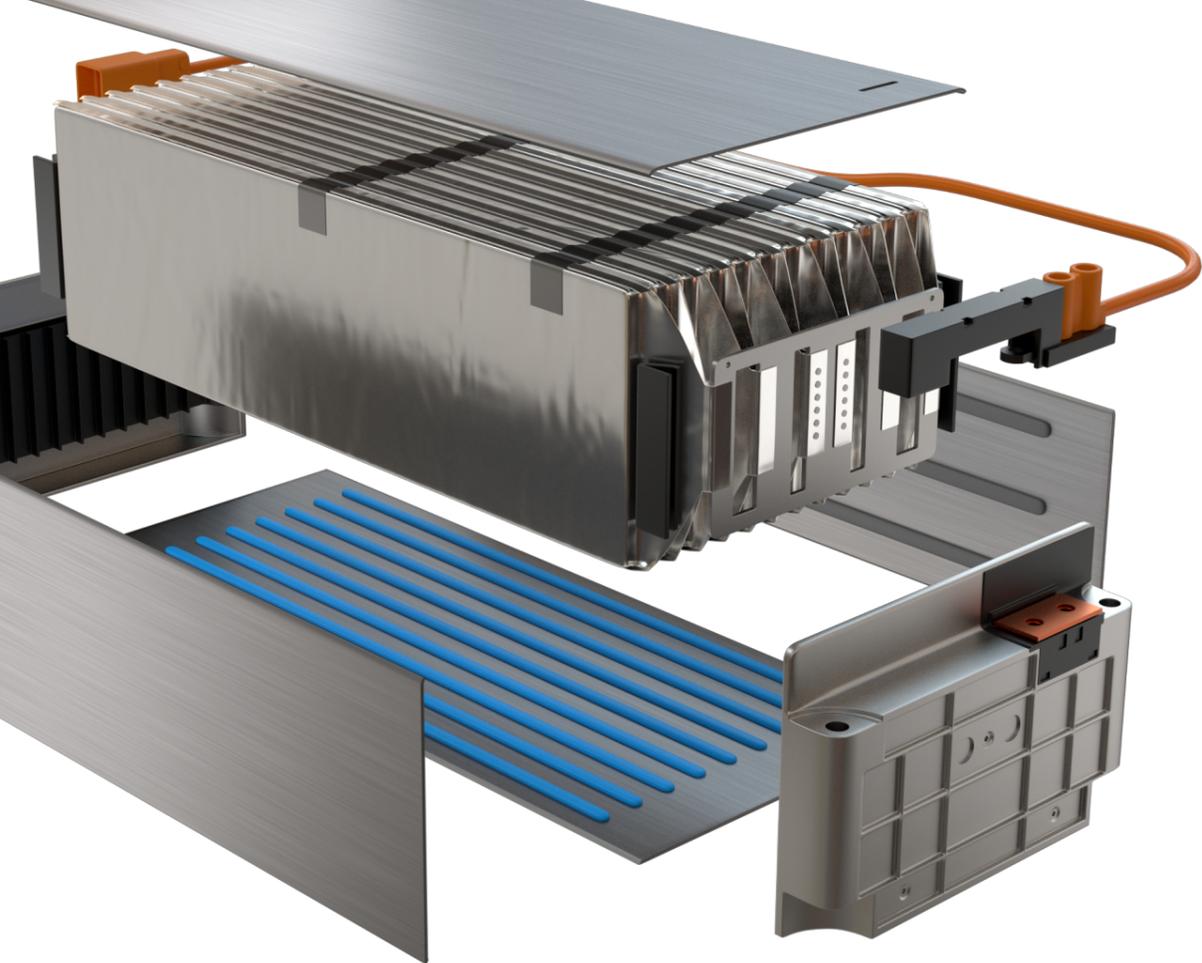
BATTERY THERMAL EVENT SIMULATION

Henkel simulates battery abuse scenarios, such as thermal runaway, to evaluate the performance of its safety materials. These simulations help prevent fire propagation and ensure passenger safety by validating materials under the most demanding conditions.



BATTERY MATERIAL APPLICATION SIMULATION

Henkel models adhesive and sealant dispensing to optimize application processes. By predicting flow behavior, squeeze-out, and curing effects, these simulations minimize assembly risks and ensure consistent performance across the battery pack.



CUSTOMER USE CASE

LOCTITE® TLB 9300 APSi

Two-component polyurethane thermally conductive adhesive for EV battery systems



CUSTOMER CHALLENGES

- » A major global EV battery manufacturer required an injectable thermally conductive adhesive solution that allows for bonding cell stacks into the battery module.
- » A high thermal conductivity of 3 W/mK was required to ensure efficient heat dissipation from the battery cells to the cooling system.
- » A high lap shear strength to aluminum and PET foil was also a key requirement to ensure the structural integrity of the battery cells and module.



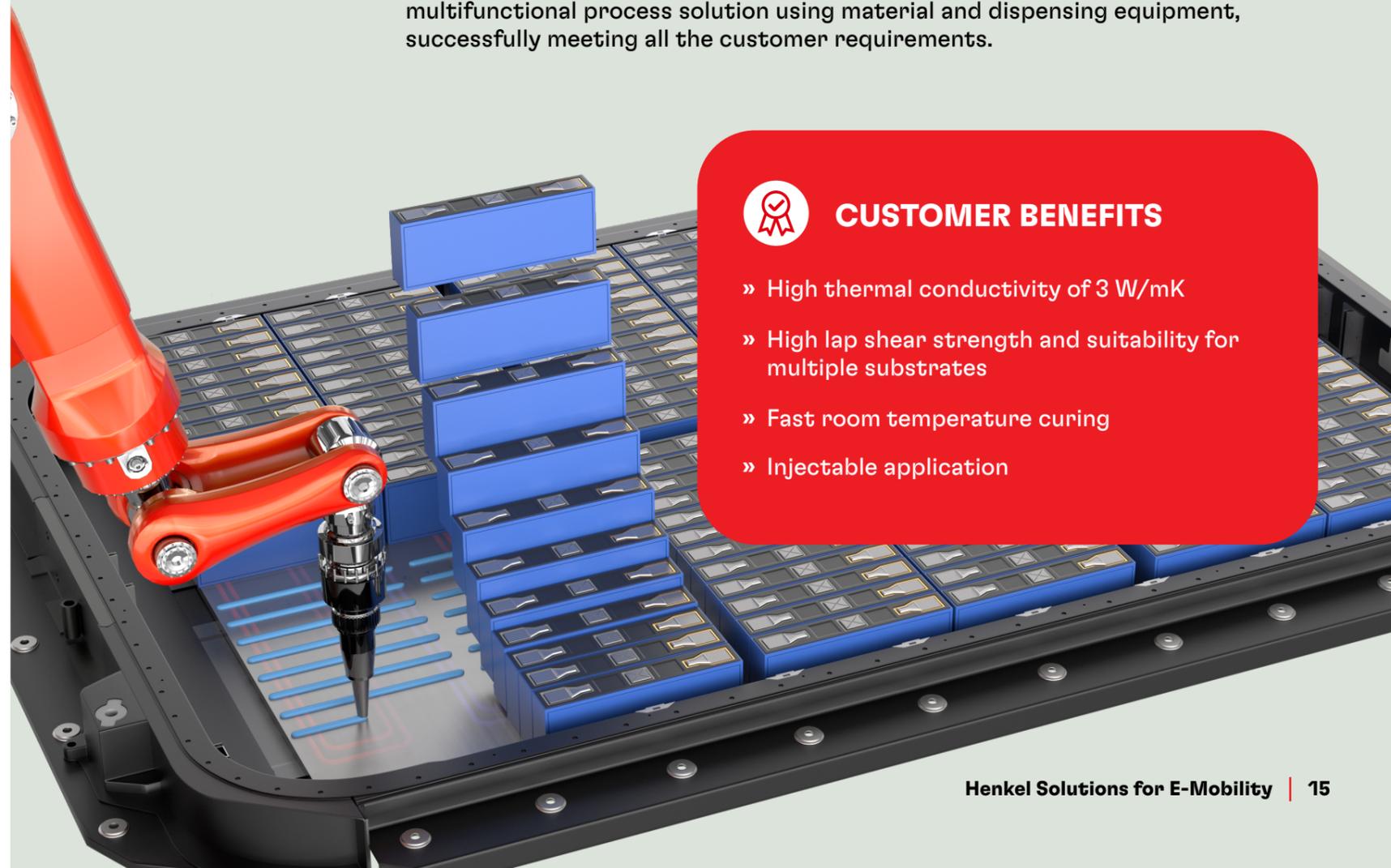
RECOMMENDED TECHNOLOGY

- » Henkel developed a two-component polyurethane thermally conductive adhesive: LOCTITE® TLB 9300 APSi.
- » The product has a moderate viscosity to fill cavities in pre-assembled modules, with fast curing at room temperature.
- » The product has an optimal filler load and provides a thermal conductivity of 3 W/mK, allowing ample heat dissipation along with strong bonding performance.



MASS PRODUCTION PROCESS SET-UP

- » Henkel's E-Mobility experts provided the customer's teams with close technical and on-site engineering support, helping them scale up quickly and efficiently with the new solution.
- » The solution enables the customer to produce > 10,000 battery modules a day on several production lines.
- » Through trustful collaboration with the customer and the dispensing equipment supplier, Henkel ensured the successful implementation of the complex and multifunctional process solution using material and dispensing equipment, successfully meeting all the customer requirements.



CUSTOMER BENEFITS

- » High thermal conductivity of 3 W/mK
- » High lap shear strength and suitability for multiple substrates
- » Fast room temperature curing
- » Injectable application

HENKEL SOLUTIONS FOR POWER CONVERSION SYSTEMS

17 THERMALLY CONDUCTIVE ADHESIVES

Printed circuit board

17 GAP PAD®

Heat source or heat sink

18 GAP FILLER

Component/PCB to housing or heat sink

19 POTTING MATERIALS

PCB/induction coils

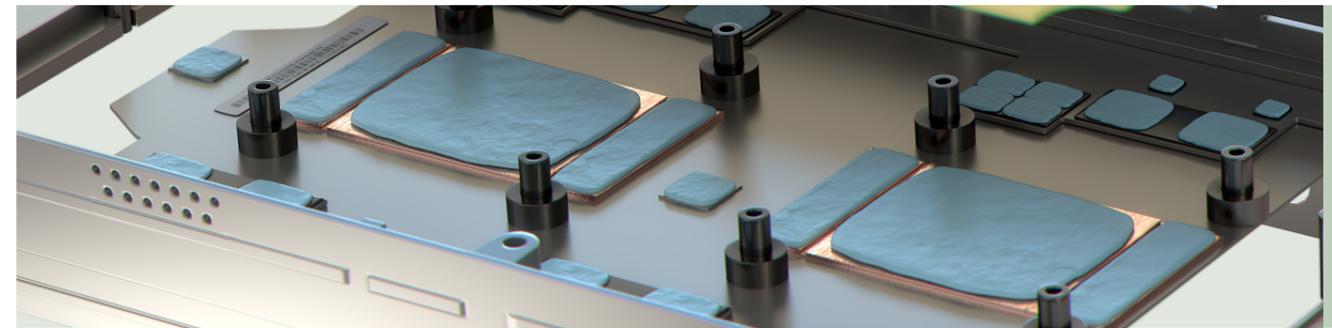
20 GASKETING

Top cover to lower tray



THERMALLY CONDUCTIVE ADHESIVES

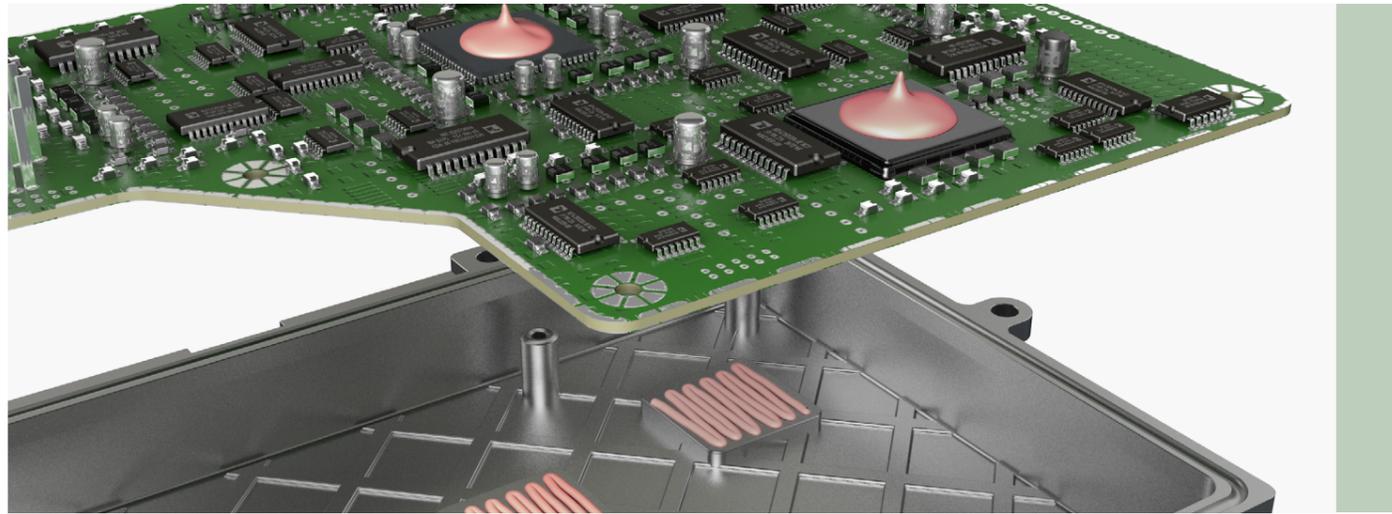
Product	Chemistry	Curing	Thermal conductivity	Key properties
<u>BERGQUIST® TLB SA2005RT</u>	Silicone	RT or heat	2.0 W/mK	High elongation, UL94 V0 compliance.
<u>BERGQUIST® TLB SA3500</u>	Silicone	Heat (125°C 20 min; 150°C 10 min)	3.5 W/mK	Good flexibility, UL94 V0.
<u>BERGQUIST® TLB EA1800</u>	Epoxy	Heat	1.8 W/mK	UL94 V0, high strength, chemical stability.



GAP PAD®

Product	Thermal conductivity	Dielectric breakdown voltage	Hardness / Young's Modulus	Key properties
<u>BERGQUIST® TGP 1000HD</u>	1.0 W/mK	5,000 V at 0.5 mm	Shore 00 = 15 / YM = 16 psi	For high-voltage application. Robust polyamide carrier provides excellent voltage breakdown, puncture and tear resistance.
<u>BERGQUIST® TGP 1000VOUS</u>	1.0 W/mK	6,000 V at 0.5 mm	Shore 00 = 5 / YM = 8 psi	Ultra-soft, self-tacky one side.
<u>BERGQUIST® TGP HC3000</u>	3.0 W/mK	> 10,000 V at 0.5 mm	Shore 00 = 15 / YM = 16 psi	High compliance, low compression stress, fiberglass reinforced for shear and tear resistance.
<u>BERGQUIST® TGP HC5000</u>	5.0 W/mK	5,000 V at 0.5 mm	Shore 00 = 35 / YM = 17.5 psi	Highest compliant, low volatility resin.

DISCOVER OUR PORTFOLIO FOR POWER CONVERSION SYSTEMS



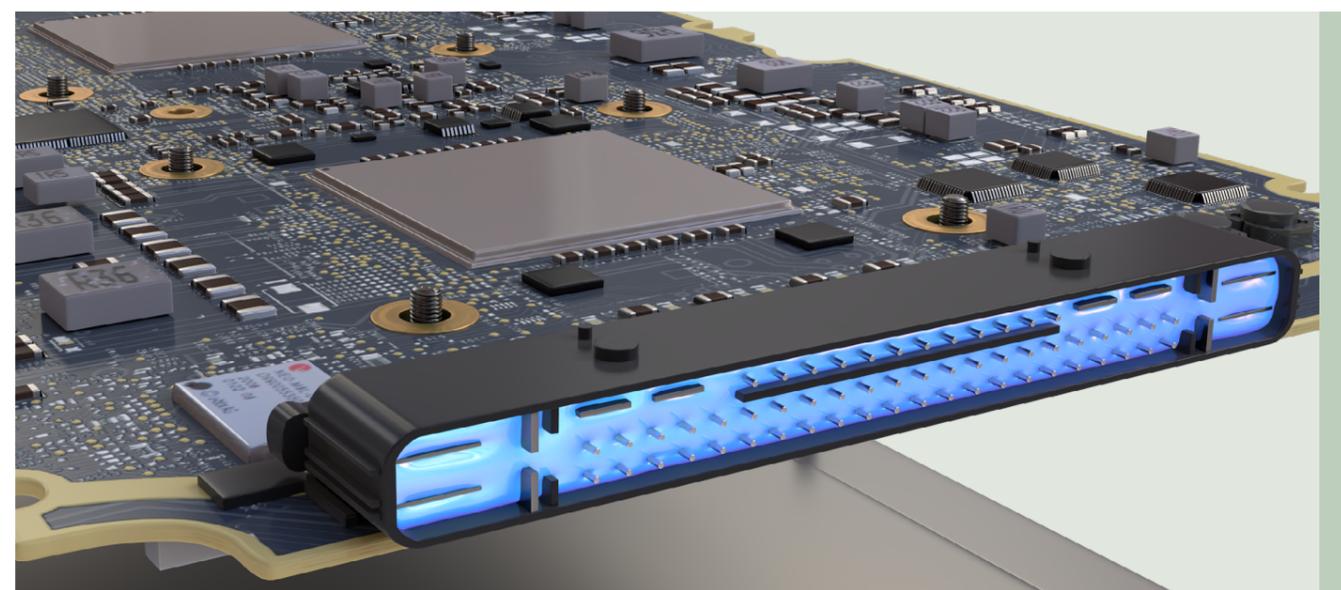
GAP FILLERS

Product	Chemistry	Curing	Thermal conductivity	Key properties
BERGQUIST® TGF 2210	Silicone	Heat	2.2 W/mK	Low volatility for out-gassing-sensitive, easy to dispense, low density (2.06 g/cm ³), excellent mechanical and thermal stability from -40°C up to 150°C.
BERGQUIST® TGF 1500	Silicone	RT or heat	1.8 W/mK	Low siloxane volatility, high temperature resistance.
BERGQUIST® TGF 2100LVO	Silicone	RT or heat	2.2 W/mK	Low volatility silicone gap filler.
BERGQUIST® TGF 3500LVO	Silicone	RT or heat	3.6 W/mK	Low Young's Modulus, high dielectric isolation.
BERGQUIST® TGF 3600	Silicone	RT or heat	3.6 W/mK	High thermal conductivity, ultra-low Young's Modulus.
BERGQUIST® TGF 4000	Silicone	RT or Heat	4.0 W/mK	High performance, soft and vibration dampening, operating temperature - 60°C to + 200°C.
BERGQUIST® TGF 4000LVO	Silicone	RT or Heat	4.0 W/mK	Low volatility silicone gap filler.
BERGQUIST® TGF 4400LVO	Silicone	RT or Heat	4.4 W/mK	Low volatility silicone gap filler.

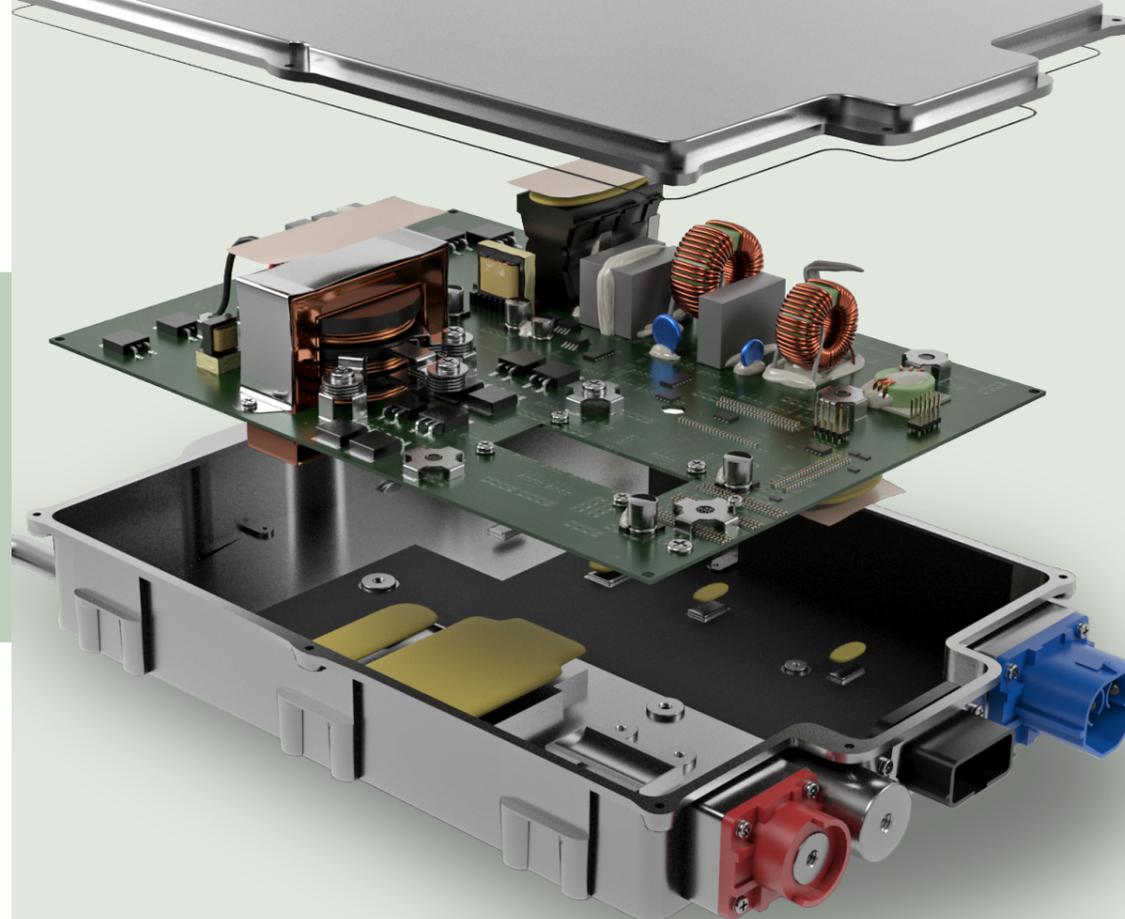
RT = Room temperature curing

POTTING MATERIALS

Product	Chemistry	Thermal conductivity	Viscosity (mixed)	Key properties
LOCTITE® SI 5631	Silicone	1.0 W/mK	5,000 mPa·s	Excellent cavity filling, flexible and robust.
LOCTITE® SI 5643	Silicone	1.5 W/mK	6,000 mPa·s	Ultra-soft, excellent flow performance.
LOCTITE® SI 5636	Silicone	2.1 W/mK	5,500 mPa·s	Low stress, increased thermal conductivity.
LOCTITE® EA 9496	Epoxy	1.7 W/mK	15,000 – 40,000 mPa·s	Room temperature and warm cure, low shrinkage.
SONDERHOFF FERMADUR SERIES	Polyurethane	0.2 – 0.9 W/mK	500 – 200,000 mPa·s	Room temperature and warm cure, customizable, UL94 V0, multi-substrate adhesion.



DISCOVER OUR PORTFOLIO FOR **POWER CONVERSION SYSTEMS**



GASKETING

Product	Chemistry	Curing	Serviceability	Key properties
LOCTITE® SI 5970	Silicone	RTV / FIPG	Yes*	High temperature stability, good moisture barrier, multi-substrate bonding.
LOCTITE® SI 5421	Silicone	RTV / FIPG	Yes*	EMI gasketing, high temperature stability, good moisture barrier, multi-substrate bonding.
LOCTITE® AA 5884	Polyacrylate	UV / CIPG	Yes	Quick cure, durable for heavy duty applications, compressible for good sealing capability, ATF and high temperature resistance, non-silicone.
BERGQUIST® TLB 400SLT	Silicone	RTV or heat / FIPG	Yes*	Highly elastic, water glycol-resistant, multi-substrate bonding, compatible with additional cure materials due to room temperature cure kinetics.
LOCTITE® AA 5820	Polyacrylate	RTV / FIPG	Yes*	Durable for heavy duty applications, ATF and high temperature resistance, compatible with BERGQUIST® GAP FILLER.
LOCTITE® SI 5039	Silicone	UV + Moisture / CIPG	Yes	Flexible cure mechanism, durable for heavy duty applications, multi-substrate bonding, compressible for good sealing capability, high temperature resistance.
SONDERHOFF FERMAPOR K31 SERIES	Polyurethane foam	RTV / FIPFG	Yes	Customizable, compressible, fast-cure, tolerance adaptable, complete system solution with dosing equipment.
SONDERHOFF FERMASIL SERIES	Silicone foam	RTV / FIPFG	Yes	Customizable, compressible, water-resistant, tolerance adaptable, complete system solution with dosing equipment.

FIPG = Formed-in-place gasket, CIPG = Cured-in-place gasket, RTV = Room-temperature-vulcanizing

*Tools required

CUSTOMER USE CASE

LOCTITE® SI 5970, BERGQUIST® TGF 3600, BERGQUIST® TGP 1000VOUS



CUSTOMER REQUIREMENT

- » A Tier 1 automotive supplier designed a new high-voltage EV inverter, which required reliable thermal management for safe and efficient function over lifetime.
- » Due to this nature of the inverter, which was designed to handle very high voltages, the Thermal Interface Materials (TIM) needed to be electrically insulating to avoid electrical hazards.
- » The compatibility of the gasketing and TIM chemistry was important, as multiple chemistries in the same component can cause contamination issues which could lead to curing and operational issues.



RECOMMENDED TECHNOLOGY

- » To fill larger, multi-level gaps, **BERGQUIST® GAP FILLER TGF 3600** with 3.6 W/mK and 0.9 to 5.4 g/sec dispense rate was selected, as it was proven to perform reliably for an existing application.
- » Ultra-soft, conformable **BERGQUIST® GAP PAD® TGP 1000VOUS** was chosen as the solution for various components to provide thermal management along with providing high voltage breakdown strength to protect against high voltage surge.
- » **LOCTITE® SI 5970** was recommended for sealing the inverter, as it is approved by multiple OEMs and Tier 1 Suppliers for its compatibility with other chemistries of gap filler and potting compounds.



PROCESS DESIGN/PRODUCTION SET-UP

- » Leveraging Henkel's partnerships with multiple dispensing equipment suppliers, the customer was able to select the best dispensing equipment for the liquid gap filler.
- » To ensure GAP PAD® integrity, Henkel initiated an additional testing phase with a third-party laboratory to verify material cleanliness and purity in order to exclude any possibility of electrical shorts due to particle contamination.
- » This multi-material solution helped bring one of the EV industry's highest voltage inverters to commercialization, allowing an annual production capacity of > 500,000 inverters.



CUSTOMER BENEFITS

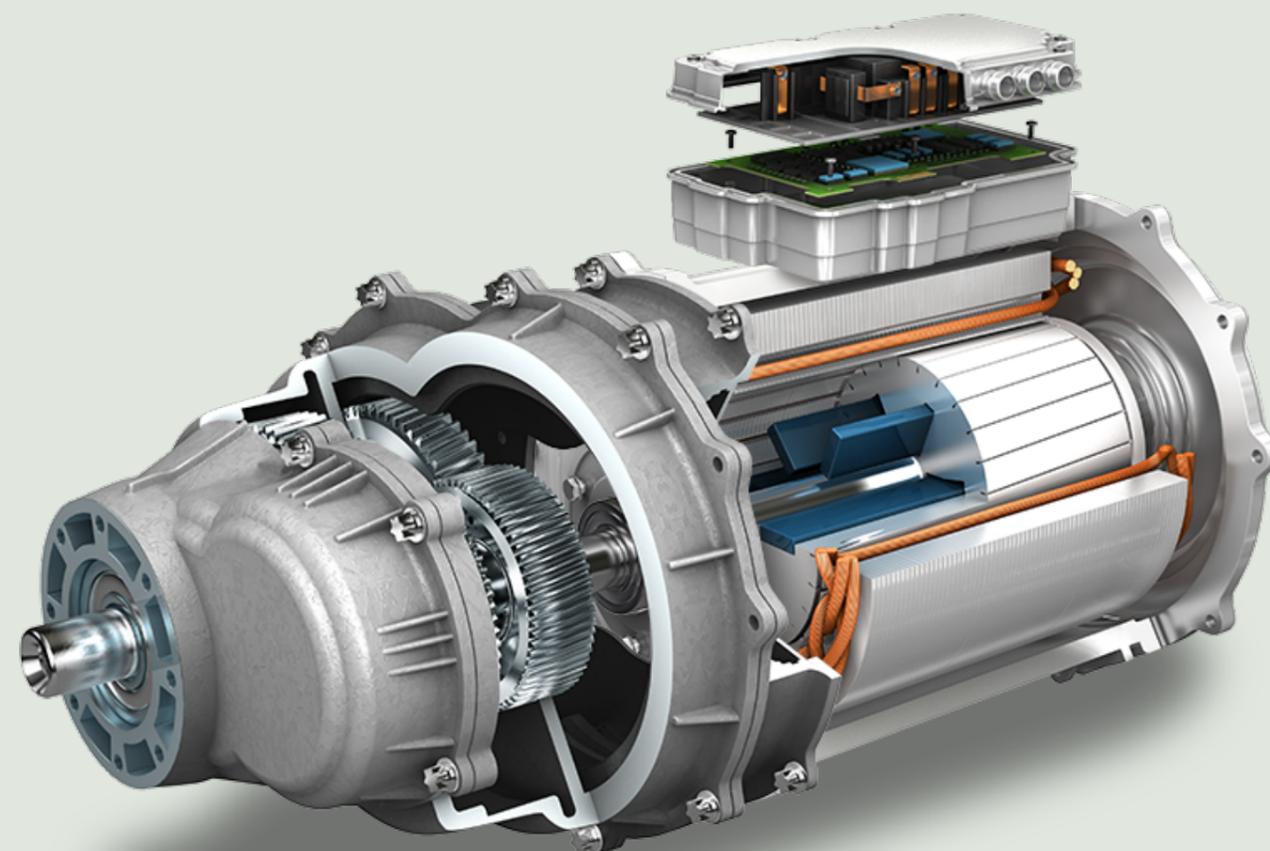
- » Reliable potting material performance
- » Process optimization by removing need for vacuum de-airing
- » Complete coverage of the coils and filling of all gaps

HENKEL SOLUTIONS FOR E-DRIVE SYSTEMS

24 GASKETING
E-Drive housing/ ECU housing

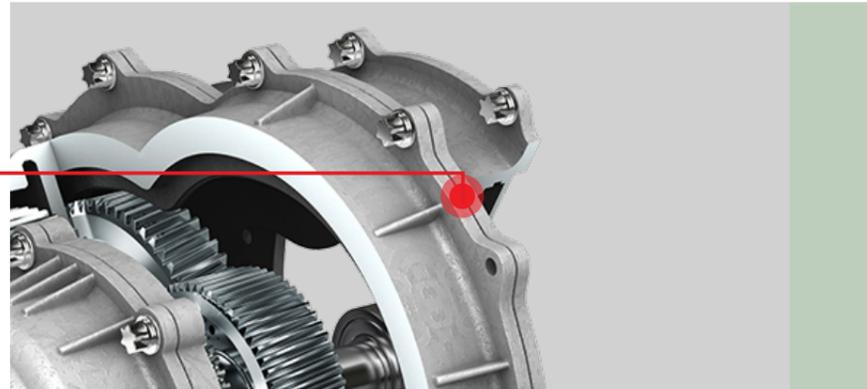
25 THERMAL POTTING
Induction coil

25 MAGNET BONDING
Magnet to stator



DISCOVER OUR PORTFOLIO FOR E-DRIVE SYSTEMS

GASKETING

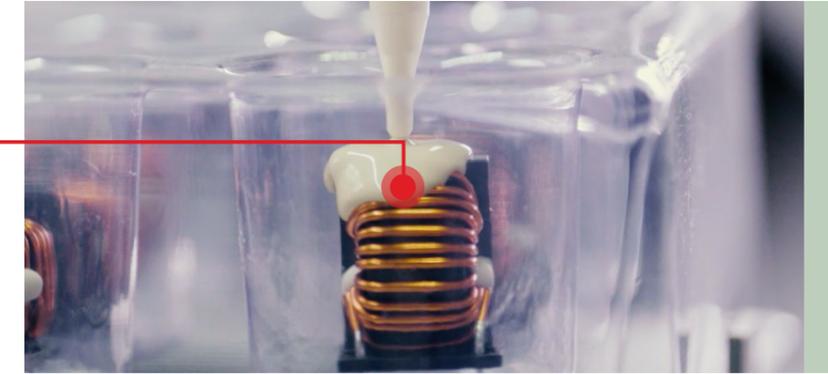


GASKETING

Product	Chemistry	Curing	Serviceability	Processing time	Key properties
LOCTITE® AA 5821	Polyacrylate	RTV	No	25 – 45 min	Silicone-free, superior hot oil / ATF resistance, joint movement tolerant for sealing of flexible joints, non-sagging, easy to automate.
LOCTITE® AA 5884	Polyacrylate	UV / CIPG	Yes	30 sec at 270 mW/cm ²	Durable for heavy duty applications, ATF and high temperature resistance, compatible with BERGQUIST® GAP FILLER.
LOCTITE® SI 5970 BM	Silicone	RTV / FIPG	No	< 25 min	High temperature stability, good moisture barrier, multi-substrate bonding, bubble minimized, excellent oil resistance.
BERGQUIST® TLB 400SLT	Silicone	RTV or heat	No	Yes	Highly elastic, water glycol-resistant, multi-substrate bonding, compatible with additional cure materials due to room temperature cure kinetics.

FIPG = Formed-in-place gasket, CIPG = Cured-in-place gasket, RTV = Room-temperature-vulcanizing

THERMAL POTTING

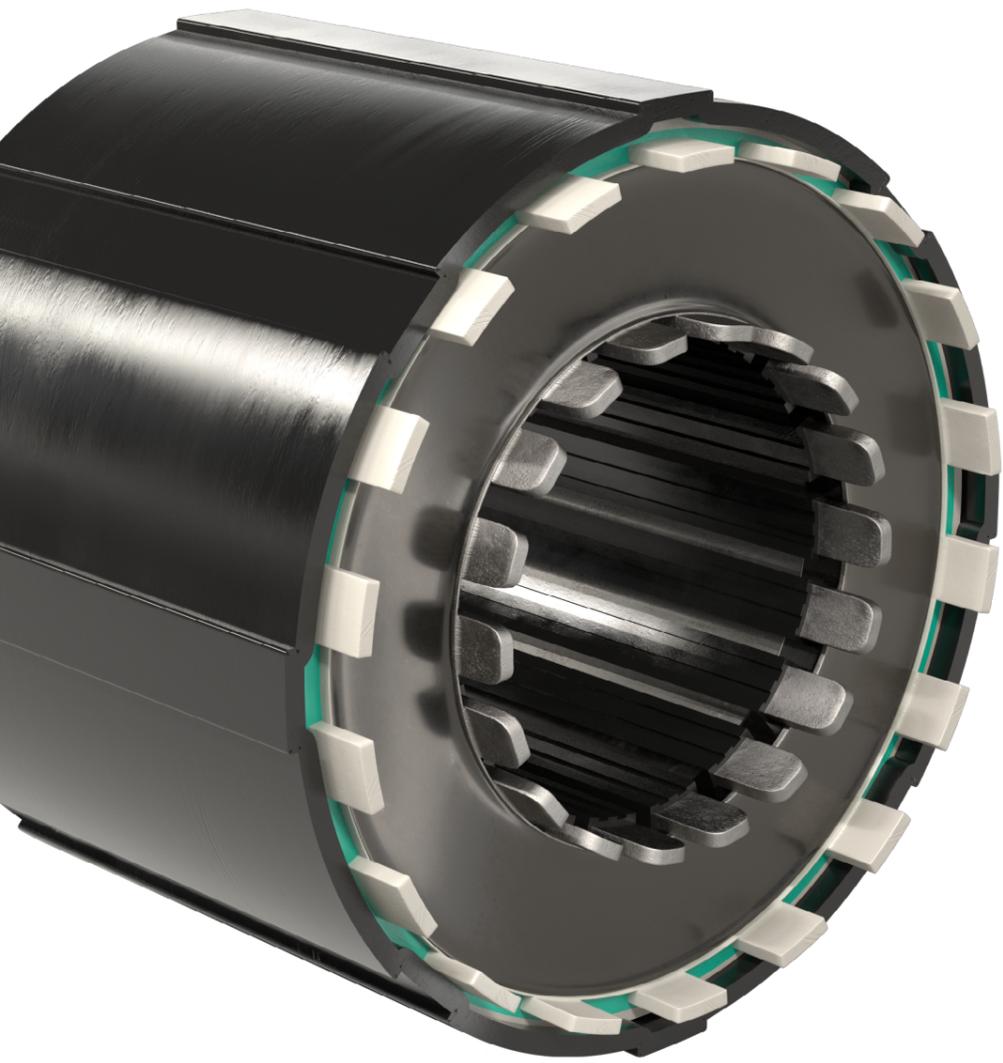


POTTING MATERIAL

Product	Chemistry	Thermal conductivity	Viscosity (mixed)	Key properties
LOCTITE® SI 5643	Silicone	1.5 W/mK	5,500 mPa·s	Two-component, fast curing, low viscosity thermally conductive potting compound.
LOCTITE® PE 1000LV	Epoxy	—	9,500 – 12,500 mPa·s	Excellent oil resistance, good thermal shock resistance, good rheology performance.
LOCTITE® PE 8083	Epoxy	1.0 W/mK	15,000 – 25,000 mPa·s	High lap shear strength (20 MPa), high decomposition temperature (350°C).
LOCTITE® PE 8086	Epoxy	1.5 W/mK	1,400 mPa·s	Thermal stability (180°C), excellent crack resistance.
LOCTITE® SI 5631	Silicone	1.0 W/mK	5,000 mPa·s	Low viscosity at room temperature, high elongation rate (> 180%).
LOCTITE® STYCAST 2850FT CAT 27-1	Epoxy	1.1 W/mK	150,000 mPa·s	Small filler size to fill small gaps, good physical and chemical properties at high temperatures.

MAGNET BONDING

Product	Chemistry	Curing	Viscosity (mixed)	Key properties
LOCTITE® 638	Acrylic	3 min at 60°C, then rest at RTV for 2 min	2,500 mPa·s	ATF resistance, high temperature resistance up to 200°C, multi-substrate bonding, 4,500 psi.
LOCTITE® 648	Acrylic	3 min at 60°C, then rest at RTV for 2 min	500 mPa·s	ATF resistance, high temperature resistance up to 200°C, multi-substrate bonding, 3,900 psi.
LOCTITE® STYCAST A 316-48	Epoxy	30 min at 100°C, or 5 min at 120°C	50,000 mPa·s	ATF resistance, high temperature resistance up to 180°C, good gap filling performance, high viscosity (50,000 mPa·s).



CUSTOMER USE CASE **LOCTITE® PE 1000LV**

E-MOTOR CONNECTOR RING POTTING PROTECTION AND STREAMLINED PRODUCTION



CUSTOMER CHALLENGES

- » A leading automotive supplier required a reliable potting solution for the stator of its new hybrid electric motor.
- » The material had to protect the ring's internal coils from physical damage, electrical shorts, moisture, automotive fluids and thermal shock.
- » The application process had to be optimized by removing the need for vacuum de-airing before dispensing and curing.



RECOMMENDED TECHNOLOGY

- » Henkel developed a new potting formulation, LOCTITE® PE 1000LV, which passed thermal shock testing without any cracks, exhibits excellent resistance to automatic transmission fluids and provides robust vibration endurance.
- » The rheology of the potting material strikes the right balance between self-leveling and thixotropic behavior.
- » As a result, it provides optimized filling of all spaces with deep penetration of the coils without any voids.



MASS PRODUCTION PROCESS SET-UP

- » Henkel formulated LOCTITE® PE 1000LV with significantly less bubbles, eliminating the need for vacuum de-airing before dispensing.
- » This new optimized application process allows to save approximately 40 minutes to one hour per shift.
- » The material allowed the Tier 1 supplier to increase the yield and successfully produce > 100,000 electric motors annually.

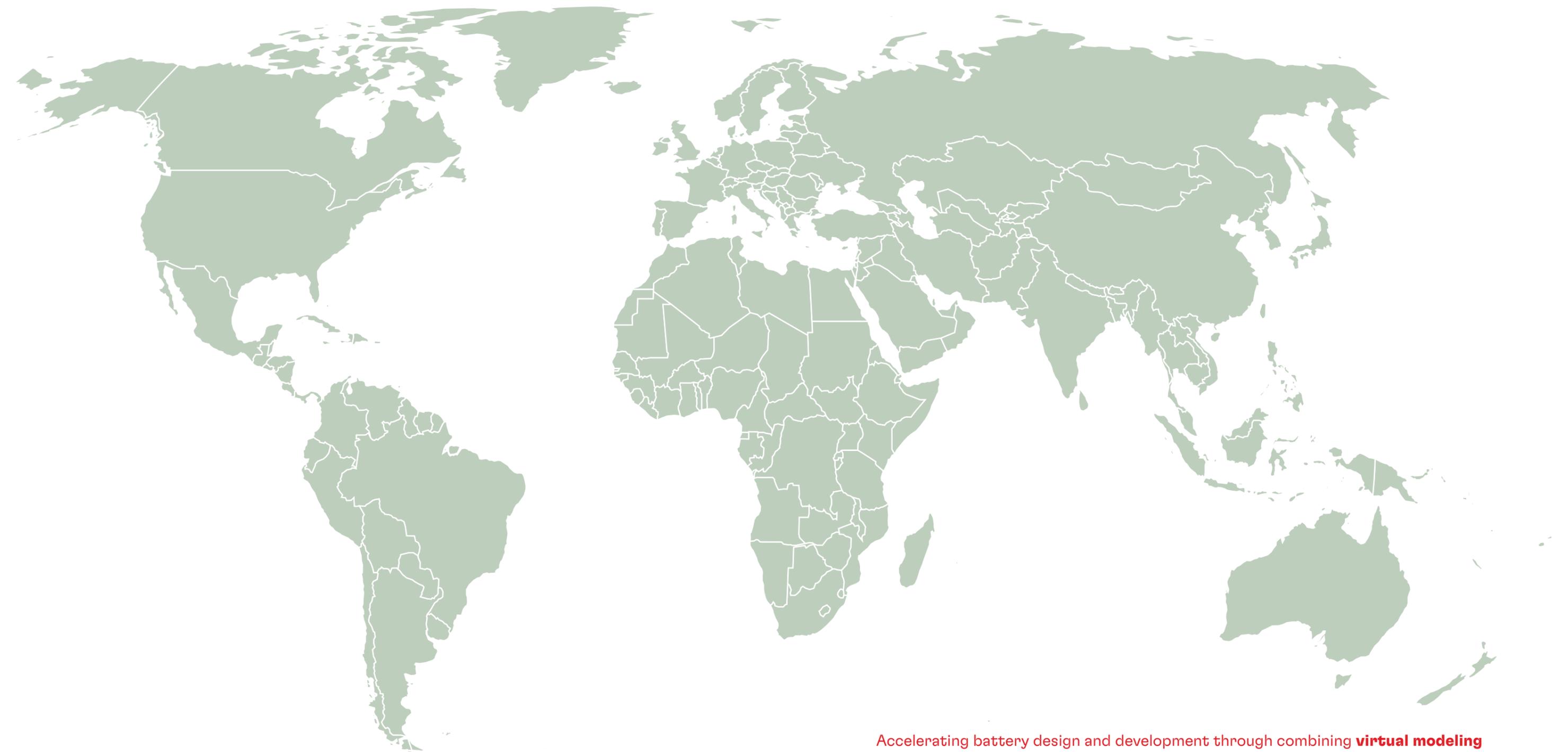


CUSTOMER BENEFITS

- » Component protection against environmental factors
- » Complete coverage of the coils and filling of all gaps
- » Process optimization by removing need for vacuum de-airing

DISCOVER HENKEL'S

BATTERY ENGINEERING CENTERS



Accelerating battery design and development through combining **virtual modeling and simulation** with **real-life material application and full-scale battery testing and validation.**

DISCOVER HENKEL'S BATTERY APPLICATION CENTER DÜSSELDORF, GERMANY



- 1 8 DISPENSERS IN TURRET MAGAZINE
- 2 2 LARGER APPLICATION UNITS FOR FLAT STREAMING
- 3 SIX-AXIS KUKA ROBOT
- 4 ATLAS COPCO PUMPING STATION
- 5 WORKTABLE OF 2.4 X 1.6 M



MATERIAL SOLUTIONS

- » Thermal Gap Fillers
- » Thermally Conductive Adhesives
- » Battery Safety Coatings
- » Structural Adhesives
- » Gasketing Materials
- » Potting Materials



CHEMISTRIES

- » PU
- » Epoxy
- » Silicone
- » SMP/MS
- » Acrylics
- » Cold Butyls



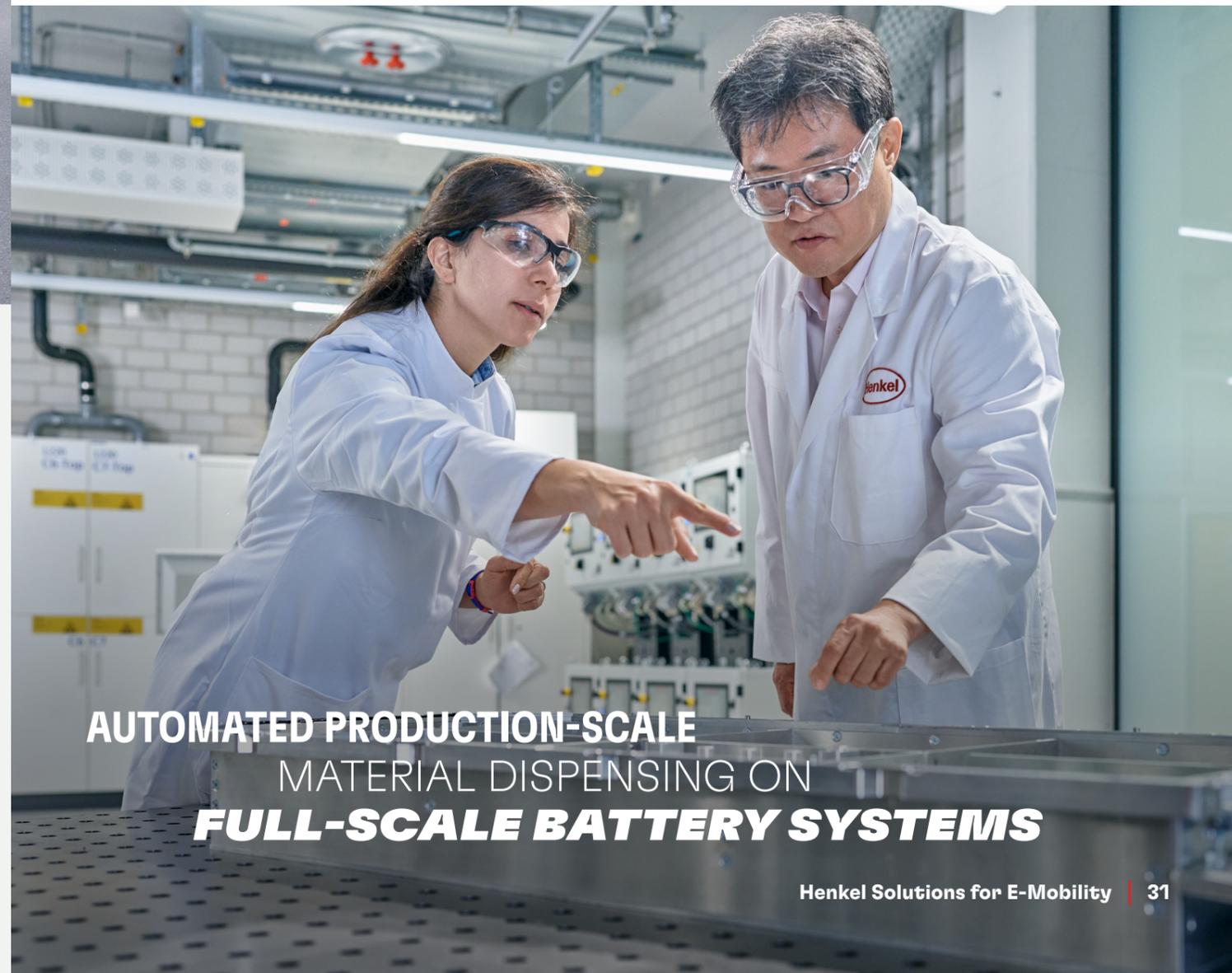
APPLICATIONS

- » 1-component
- » 2-component
- » Flat stream



CERTIFICATION

- » Trusted Information Security Assessments Exchange (TISAX)



**AUTOMATED PRODUCTION-SCALE
MATERIAL DISPENSING ON
FULL-SCALE BATTERY SYSTEMS**

DISCOVER HENKEL'S BATTERY TEST CENTER DÜSSELDORF, GERMANY



SIMULATION

- » Digital twin of materials
- » Material cards
- » Structural & thermal performance



CERTIFICATIONS

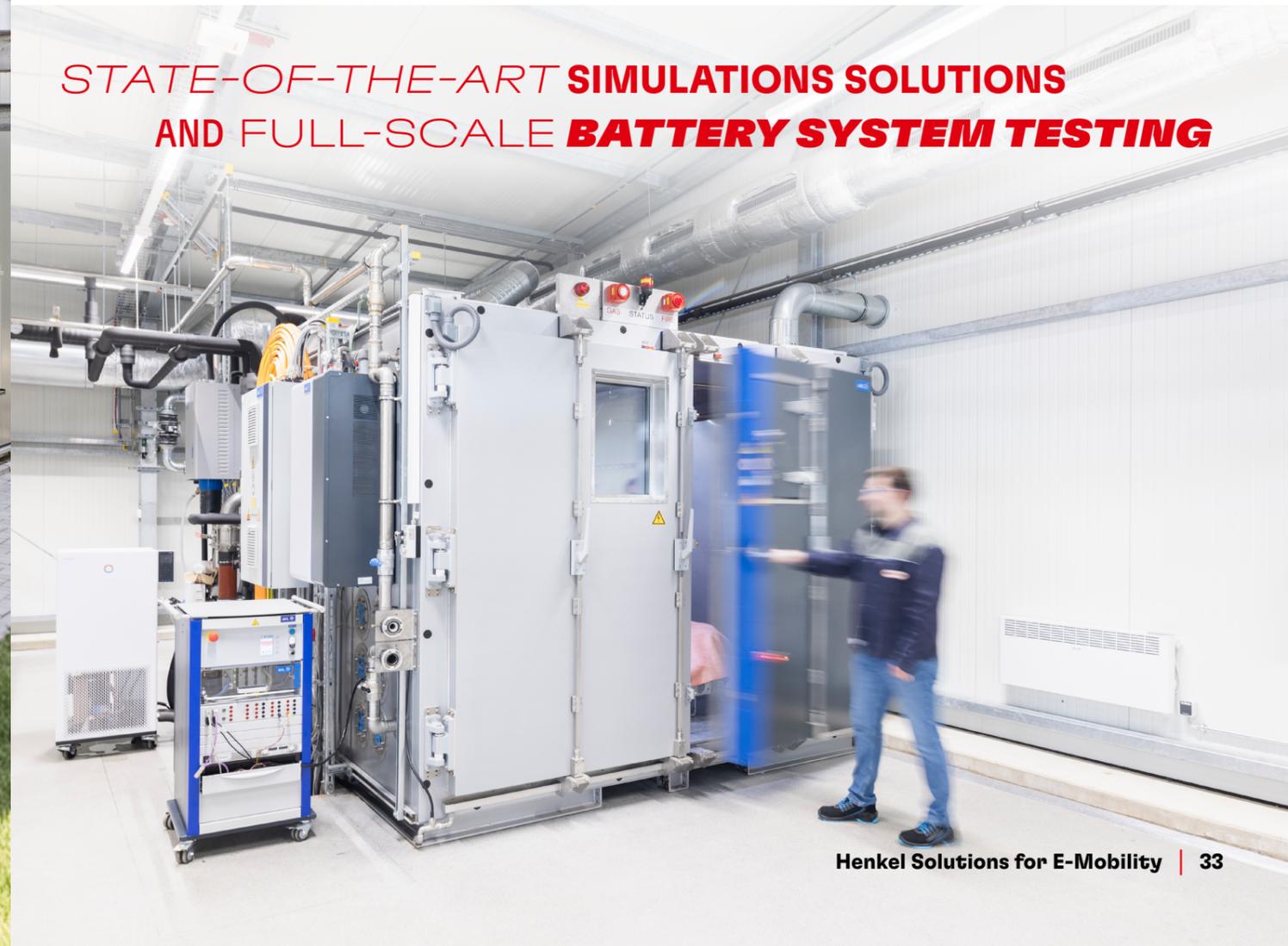
- » Trusted Information Security Assessment Exchange (TISAX)



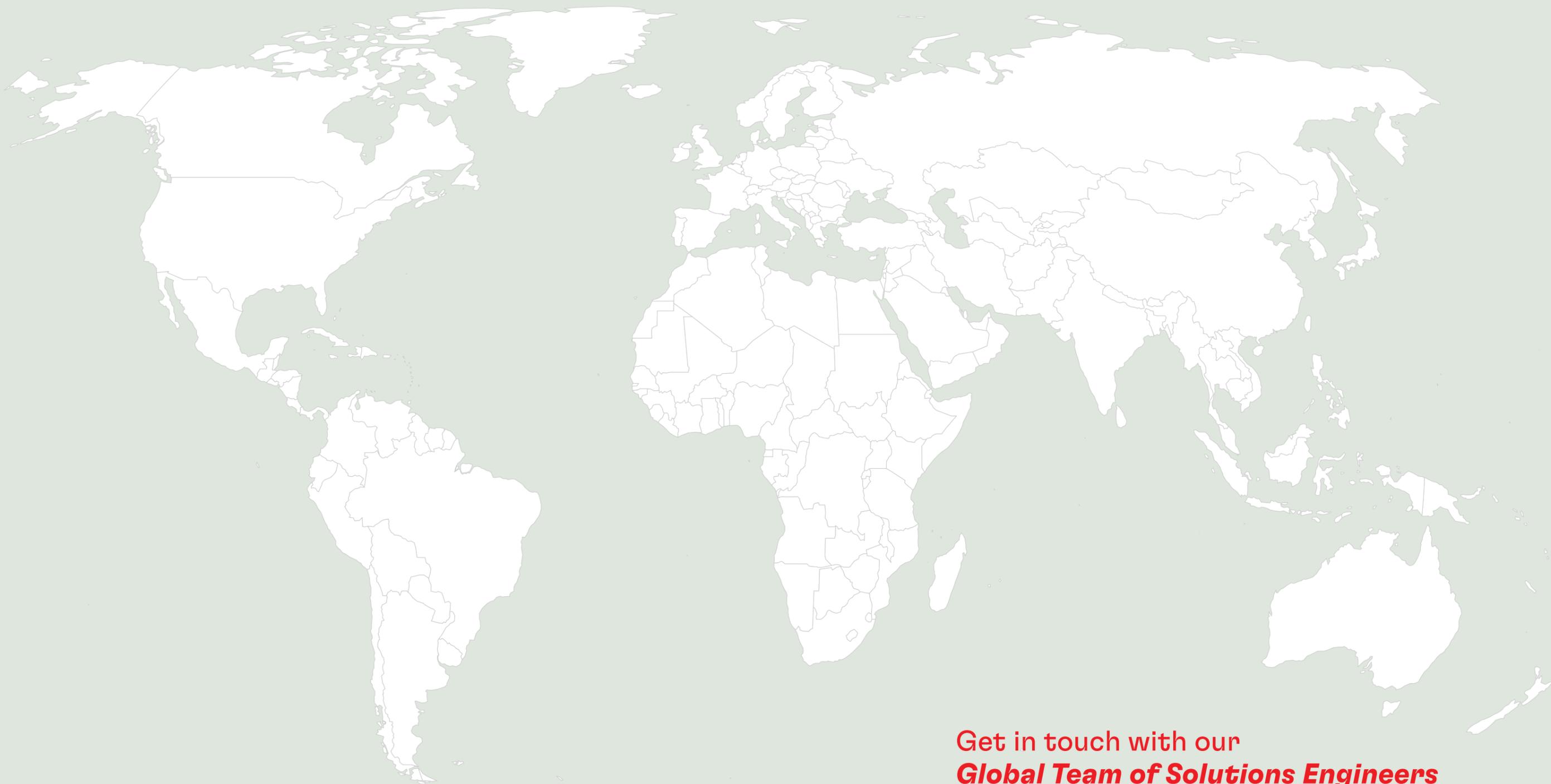
TESTING

- » Test rig with full end-of-line test capability
- » Fast charging up to 330 kW and discharging back into the grid
- » Test rig combined with a climate chamber (temperature range -40 to + 90°C, with 10 to 95% relative humidity)
- » Active operation of battery liquid cooling during tests
- » Storage and emergency containers for HV batteries
- » Assembly and workshop area with electrical experts

STATE-OF-THE-ART SIMULATIONS SOLUTIONS AND FULL-SCALE BATTERY SYSTEM TESTING



INNOVATION FOR
ZERO-EMISSION MOBILITY



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