

ADHESIVES FOR E-MOBILITY AND AUTOMOTIVE ELECTRONICS

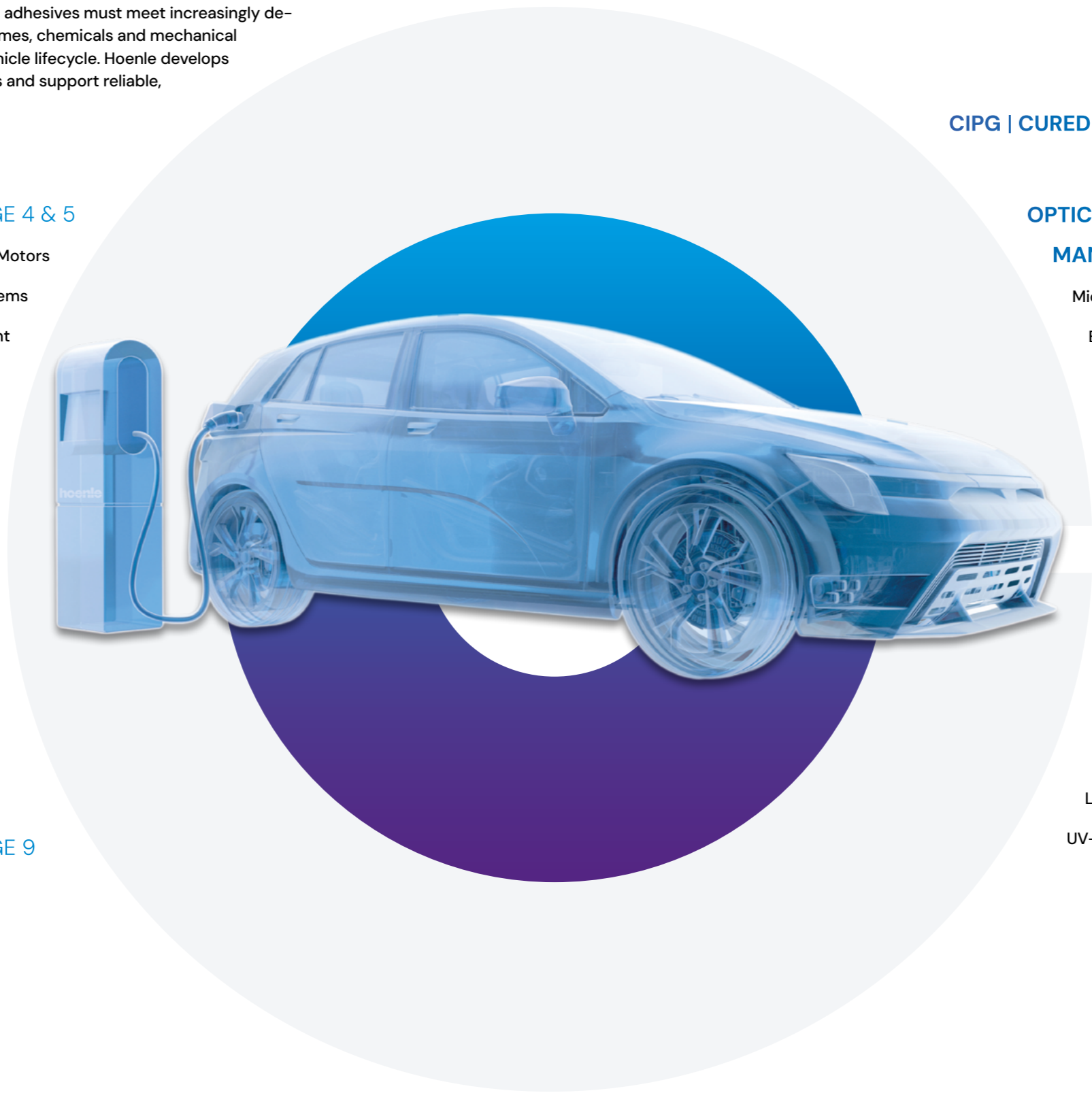


State-of-the-art adhesives and
curing systems for applications
in the automotive industry

ADHESIVES FOR AUTOMOTIVE AND E-MOBILITY

Adhesive bonding is a well-established key technology in automotive manufacturing. It enables lightweight design, functional integration and highly efficient, automated assembly processes. Components that were once soldered, screwed or welded can now be bonded reliably with long-term stability and design flexibility.

Especially in vehicle electronics and sensor applications, adhesives must meet increasingly demanding requirements. Resistance to temperature extremes, chemicals and mechanical stress is essential to ensure durability over the entire vehicle lifecycle. Hoenle develops advanced adhesive solutions that meet these challenges and support reliable, future-ready automotive designs.



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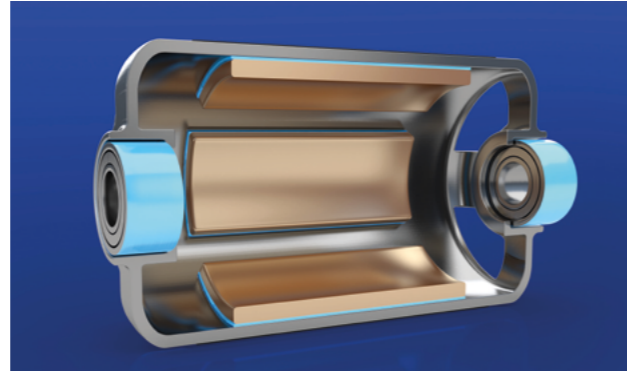
LED Conveyor Belts

UV-Measurement

E-MOBILITY

E-MOTORS

Electric drives are becoming more powerful and efficient. At the same time, the component volume is decreasing. This has increased demands for materials to provide higher mechanical, chemical, and thermal resistance in order to ensure long-lasting operation. Hoenle's new adhesives meet these requirements. They adhere particularly well to various metals, ferrites and copper coils, and are suitable for a wide range of applications such as magnet bonding, stator pack assembly, and potting bar magnets.



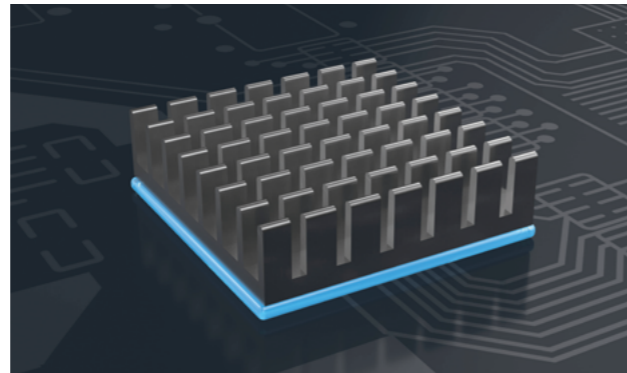
CELL CONTACTING SYSTEMS

Efficient connecting of cell systems in batteries with simultaneous flexibility can only be achieved with adhesives. Adhesives compensate for the different thermal expansion coefficients of the bonded materials. Specially developed UV glob tops and coatings protect against corrosion and at the same time offer high adhesion to the surfaces to be protected. Hoenle adhesive solutions are not only suitable for battery cells, but also for modules and battery packs.



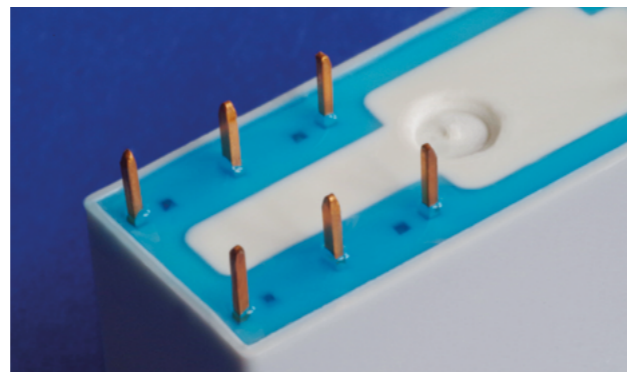
THERMAL MANAGEMENT

Many vehicle components generate heat during operation, a challenge intensified by increasing power density and ongoing miniaturization, which can reduce performance and service life. Hoenle has developed high-performance adhesives that ensure efficient heat dissipation while enabling form-fit, mechanically stable lightweight designs for applications such as batteries, electric motors, control units, sensors, and headlights.



CONNECTOR SEALING

When potting connectors, switches and relays, room temperature-curing, two-component or thermally curing (one-part) adhesives are mainly used. Hoenle also offers UV light-curing products, which are characterized by their ability to cure quickly, even in thick layers. This results in shorter production cycle times. Our products are developed with low halogen content to meet the highest standards of the electronics industry.



CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES

Adhesives and sealants play a key role in electric vehicle charging stations by ensuring the reliability and durability of electronic assemblies. SMD components are bonded or encapsulated directly on the PCB to enhance resistance to shock and vibration, while conformal coatings provide effective protection against temperature fluctuations, moisture, and other environmental influences. In addition, cured-in-place gaskets (CIPG) are used to seal the housing, preventing the ingress of chemicals, moisture and other contaminants.



Adhesives E-Mobility	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitralit® UV E-2113	Cell contacting systems, Wire rope corrosion protection	25,000 - 35,000 Rheometer 10s-1	Acrylate	UV/VIS	Fast curing, high chemical resistance
Vitralit® UV E-2115	Cell block spacer, Battery packs	80,000 - 120,000 Rheometer 10s-1	Acrylate	UV/VIS	High thixotropy index
Vitralit® UD 5180	Encapsulation of the soldering & welding joints of connectors	4,000 - 6,000 Rheometer 10s-1	1-part Epoxy	UV/thermal	High adhesion to flexible conductors, low halogen content
Vitralit® UD 4292 F	Ball bearing e-motors	40 - 70 LVT, Sp.2/30 rpm	Acrylate	UV/VIS/ anaerobic	Capillary flow, anaerobic post-curing
Vitralit® UD 8050	Weld joint potting, Cell contacting systems	8,000 - 11,000 Rheometer 5s-1	Acrylate	UV/VIS/ humidity	Jettable, moisture post-curing, low halogen content
Vitralit® UD 8055	Battery packs, Cell contacting systems	4,000 - 7,000 Rheometer 10s-1	Acrylate	UV/VIS/ humidity	High Tg, moisture post-curing, deep through-curing
Vitralit® E-VBB-1	Connector sealing	1,300 - 1,600 Rheometer 10s-1	Acrylate	UV/VIS	Very flexible, stress equalizing
Elecolit® 6603	Thermal management	20,000 - 40,000 Rheometer 10s-1	1-part Epoxy	thermal	UL94 HB, good metal adhesion, thermally conductive
Structalit® 5802	Condensator bonding Cornerbond	40,000 - 65,000 Rheometer 10s-1	2-part Epoxy	RT/thermal	General structural bonding, very good dielectric properties
Structalit® 5803	Magnet bonding	100,000 - 160,000 Rheometer 10s-1	2-part Epoxy	RT/thermal	High Tg, impact resistant
Structalit® 5858	Magnet bonding	82,000 - 100,000 Rheometer 10s-1	1-part Epoxy	thermal	High Tg, impact resistant, high strength
Structalit® 8801	Structural bonding, magnet bonding, potting	30,000 - 45,000 LVT, Sp.4/6 rpm	1-part Epoxy	thermal	Good oil resistance, low outgassing, high Tg

*UV = 320-390 nm; VIS = 405 nm, RT = Room temperature

TECHNOLOGY DUAL-CURE ADHESIVES

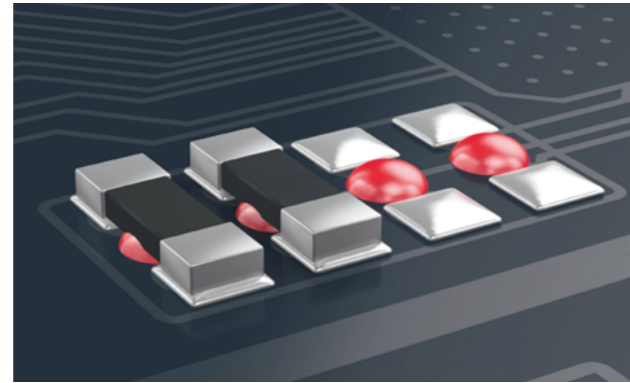


Hoenle offers adhesives that cure using UV light and moisture. They are used for components whose substrates are only partially translucent and have areas that are shadowed from the curing light. The adhesives' polymerization process is initiated by exposure to UV light and continues in shadowed areas through contact with the humidity in the air and the moisture present on the substrates.

AUTOMOTIVE ELECTRONICS

BONDING & SECURING OF COMPONENTS

Adhesives play a key role in automotive electronics by providing reliable mechanical fastening, protection against environmental influences, and electrical shielding. UV and structural adhesives are used to attach electronic components (SMDs) to printed circuit boards.

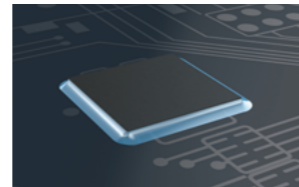


In flip-chip processes, capillary-flow adhesives are required to underfill semiconductor chips (BGAs), ensuring fast and reliable attachment.

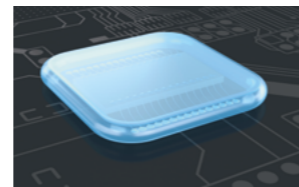
An alternative to classic underfilling is edge and corner bonding, where adhesive is applied only to the corners. This allows components to be fixed before reflow soldering and prevents movement during the soldering process.



Frame-and-fill is a wet-on-wet process using two adhesives with different viscosities. A high-viscosity adhesive forms a perimeter frame, which is then filled with a low-viscosity adhesive. These systems are available as single-component, thermally curing adhesives (typically black) or transparent UV-curable adhesives for very short cycle times and are designed to minimize stress on component connections before and after curing.



All Hoenle electronics adhesives feature high ionic purity and meet strict automotive requirements for adhesion, temperature, chemical, vibration, and climate resistance. Many can be customized for specific applications, including viscosity adjustment, added color or fluorescence for process control, and rheological properties suitable for high-volume screen printing or jet dispensing.

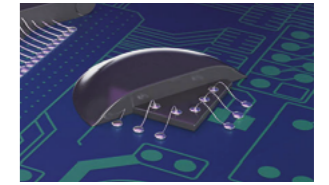


Adhesives for PCB	Application	Viscosity [mPas]	Base	Curing*	Ion purity	Characteristics
Structalit® 3060-1	Fixing electronic components	4,000 - 8,000 Rheometer, 10s ⁻¹	1-part Epoxy	thermal	●	Very fast curing, high flexibility
Structalit® 5604	Component protection SMD	25,000 - 40,000 Rheometer, 10s ⁻¹	1-part Epoxy	thermal	●	Red color, resistant to soldering temperatures up to 270 °C
Structalit® 8202	Underfill	300 - 400 Rheometer, 10s ⁻¹	1-part Epoxy	thermal	●	Capillary flow behavior, high Tg
Vitralit® E-1671	NTC Glop Top, Frame	9,000 - 14,000 Rheometer, 10s ⁻¹	1-part Epoxy	UV/thermal	●	Stable, low water absorption, high Tg
Vitralit® 1605	Fill	200 - 400 LVT, Sp.2/30 rpm	1-part Epoxy	UV/thermal	●	Ion purity, high Tg
Vitralit® 6104 VT	Condensator fixing	8,000 - 17,000 Rheometer, 10s ⁻¹	Acrylate	UV/thermal	●	Stable, high temperature resistance
Structalit® 5704	Frame	60,000 - 100,000 Rheometer, 10s ⁻¹	1-part Epoxy	thermal	●	Black color, stable, high Tg
Structalit® 5720	Fill	10,000 - 15,000 Rheometer, 5s ⁻¹	1-part Epoxy	thermal	●	High Tg

*UV = 320-390 nm, VIS = 405 nm; ● Semicon grade: DIN-EN ISO 10304-1 (D20); ● Electronic grade: (IEC 61249-2-21)

ENCAPSULATION OF HIGH-POWER ELECTRONICS (POWERTRAIN)

Adhesives are used as encapsulants (glob tops) to protect sensitive electronic components from mechanical, thermal, and chemical influences. Good dielectric properties are important here, such as high dielectric strength, tracking resistance (CTI) and a high specific resistance in order to shield closely spaced electrical contacts from each other. In addition, encapsulation protects sensitive components from direct access and manipulation.



Adhesives for Encapsulations	Application	Viscosity [mPas]	Base	Curing*	Ion purity	Characteristics
Vitralit® BL UC 1101	Encapsulation, light shielding	3,500 - 7,000 Rheometer 10s ⁻¹	1-part Epoxy	UV	●	Light curable due to Black & Light technology, deep curing up to 1.3 mm
Vitralit® UD 5180	Encapsulation on flex conductors	4,000 - 6,000 Rheometer 10s ⁻¹	1-part Epoxy	UV/thermal	●	High adhesion to PI
Structalit® 5891	Glob Top	25,000 - 50,000 Rheometer 10s ⁻¹	1-part Epoxy	thermal	●	High shock resistance, good chemical resistance
Structalit® 5894 M	Encapsulation of PCB in level sensors	20,000 - 30,000 Rheometer 20s ⁻¹	1-part Epoxy	thermal	●	Black color, high resistance to chemicals
Structalit® 8801	Glob Top, Potting/Encapsulation	30,000 - 45,000 LVT, Sp.4/6 rpm	1-part Epoxy	thermal	●	Resistant to oil and other chemicals, high adhesion to FPCB and PCB

*UV = 320-390 nm, VIS = 405 nm; ● Semicon grade: DIN-EN ISO 10304-1 (D20); ● Electronic grade: (IEC 61249-2-21)



POTTING COMPOUNDS

Selecting the right potting compound depends on multiple engineering parameters, including component geometry, substrate materials, potting depth, and the coefficient of thermal expansion (CTE) of each substrate. Curing constraints such as vacuum compatibility, temperature profile, and light transmission must also be considered. With extensive application experience, our engineering team supports the selection of optimal potting solutions from a broad product portfolio.

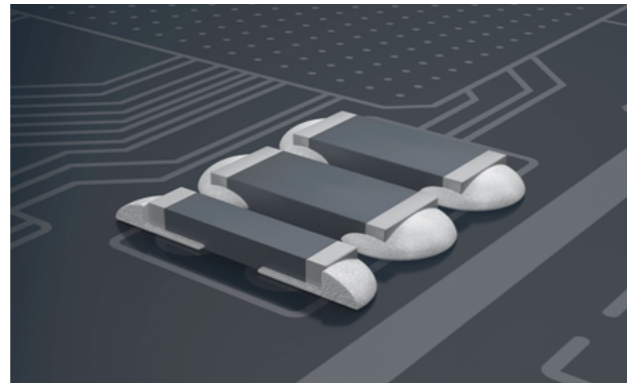
Adhesives for Potting	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitralit® 1605	Partial potting/coating	200 - 400 LVT, Sp. 2/30 rpm	1-part Epoxy	UV/thermal	Ionic purity, high Tg
Vitralit® UD 8060 F	Flexible potting	6,000 Rheometer, 10s ⁻¹	Acrylate	UV/VIS + moisture	High elongation, good adhesion to plastics and metals, resistant to high temperature and humidity
Elecolit® 6601	Thermally conductive potting	12,000 - 20,000 LVT, Sp. 4/6 rpm	1-part Epoxy	thermal	High Tg, excellent flow properties
Elecolit® 6608	High temperature potting	10,000 - 15,000 Rheometer 10s ⁻¹ 40°C	1-part Epoxy	thermal	Low CTE, high Tg, UL94 V-0
Structalit® 5801	Potting of PCB	12,000 - 22,000 Rheometer 10s ⁻¹	2-part Epoxy	RT/thermal	High chemical resistance, good dielectric properties
Structalit® 5810-1	Potting of PCB	3,000 - 4,000 LVT, Sp. 4/30 rpm	2-part Epoxy	thermal	resistant to moisture and chemicals, transparent
Structalit® 8838	Flexible potting, temperature sensitive components	6,500-7,500 Rheometer 20s ⁻¹	1-part Epoxy	thermal	low temperature curing, low Tg, flexible, resistant to temperature und moisture

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ELECTRICALLY CONDUCTIVE ADHESIVES

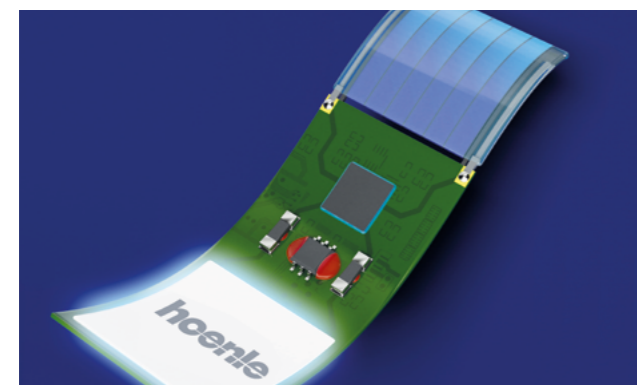
ELECTRICALLY CONDUCTIVE ADHESIVES

Automotive electronics demand maximum performance in minimal space. Hoenle's electrically conductive adhesives enable precise application in complex geometries, cure rapidly, and form reliable, long-lasting bonds. They deliver consistent electrical performance, even under demanding operating conditions. By replacing traditional soldering and allowing lower curing temperatures, they reduce cycle times, protect sensitive components, and ensure consistent high quality and long-term stability.



Electrically Conductive Adhesives	Application	Viscosity [mPas]	Base	Volume resistivity ($\Omega \cdot \text{cm}$)	Curing*	Characteristics
Elecolit® 3025	Heat-sensitive components	80,000 - 90,000 Rheometer 10s ⁻¹	2-part Epoxy	10 ⁻³	RT/thermal	Cures at room temperature
Elecolit® 3653	LED Die Attach, Semiconductor technology	4,000 - 8,000 Rheometer 10s ⁻¹	1-part Epoxy	10 ⁻³	thermal	Vibration resistant, high ionic purity
Elecolit® 3655	SMD Packaging, LED Die Attach	5,000 - 15,000 Rheometer 10s ⁻¹	1-part Epoxy	10 ⁻⁴	thermal	High Tg, high ionic purity
Elecolit® 3656	SMD Packaging, LED Die Attach	50,000 - 70,000 Rheometer 10s ⁻¹	1-part Epoxy	10 ⁻³	thermal	Stable, high dimensional stability, suitable for jetting
Elecolit® 3661	Flexible circuit carriers, Die Attach	20,000 - 40,000 Rheometer 10s ⁻¹	1-part Epoxy	10 ⁻³	thermal	Stable, high dimensional stability

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FLEXIBLE AND PRINTED ELECTRONICS

To produce design elements on curved surfaces, flexible substrates (Flex PCB) are increasingly being used in automotive electronics. For such applications, Hoenle offers particularly flexible adhesives with low curing temperatures, good electrical conductivity and high chemical, mechanical and thermal resistance (e.g. to reflow processes). Some of the adhesives offer very fast curing times (snap cure) or curing by thermode or hot press.

Flexible Adhesive	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitalit® E-4451 MV F	Coating on FPCB	2,000 - 3,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS/thermal	Elastic, dry surface
Elecolit® 3648	Conductor contacting on FPCB	10,000 - 15,000 Rheometer 10s ⁻¹	1-part Epoxy	thermal	Electrically conductive, curing from 80 °C

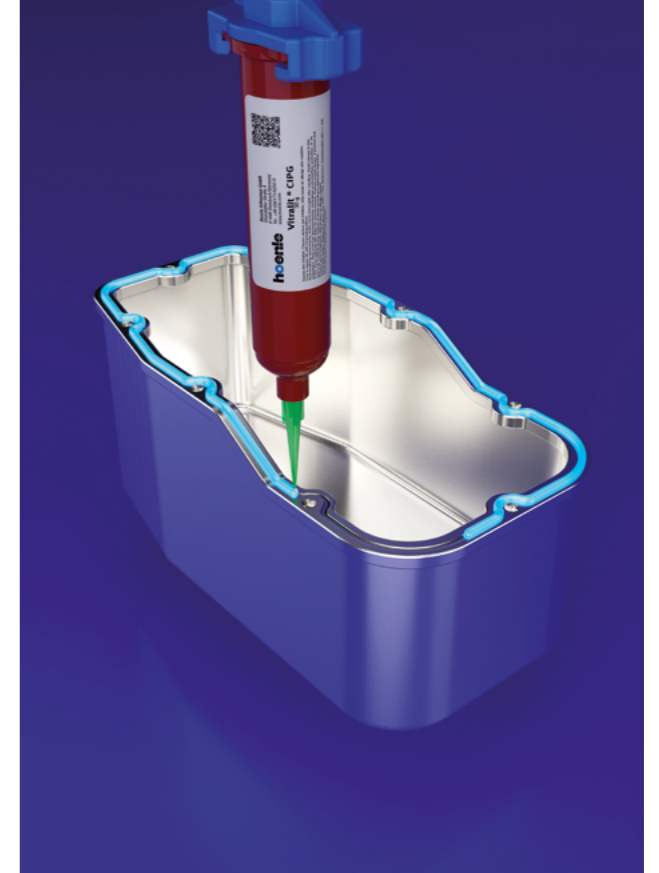
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SPECIAL APPLICATIONS

CIPG | CURED-IN-PLACE-GASKETS

CIPGs protect housed electronic components from contaminants and moisture. CIPG applications include electronic control units (ECU), cameras, sensors, on-board chargers (OBC) and battery disconnect units (BDU).

Hoenle CIPG materials are dispensed as high viscosity (gel) liquids. They can be applied to simple or complex component geometries, and then cured in seconds with UV/visible light. This can be an in-line process, as the cured CIPG is immediately ready for the next phase of the assembly process. With the adhesion of an adhesive, the CIPG will bond to one surface, preventing it from shifting or falling off during travel to the next process.



CIPG Adhesives	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitalit® CIPG 60200	Gasketing, Housing seal	65,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS	Flexible, low compression set, for complex geometries, high temperature and mechanical resistance
Vitalit® CIPG 60201	Gasketing, Housing seal	70,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS	Flexible, low compression set, for complex geometries, high temperature and mechanical resistance, improved reliability to automotive fluids
Vitalit® 5140 VT	Gasketing, Sealing	5,000 - 10,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS	Flexible, high resistance to climate changes and moisture

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INTERIOR DESIGN

Customers buying a car care not only about style, but also about quality and functionality. The dashboard must look attractive, feel solid, and perform reliably under daily use. Hoenle's adhesives give manufacturers the flexibility to design with confidence: precise and durable bonding allows more creative attachments, optimal positioning, and effective soundproofing, while improving resistance to spills, vibrations, and mechanical stress.



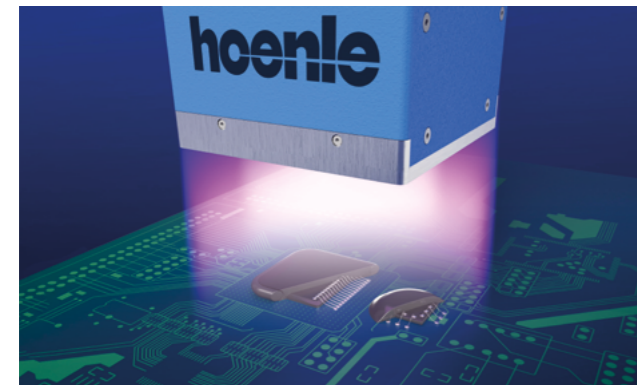
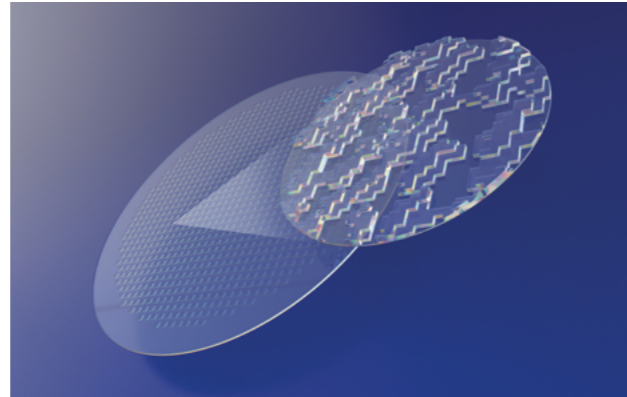
Adhesives for Interior Design	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitalit® 1655	Optical potting	150 - 300 LVT Sp. 2/30 rpm	1-part Epoxy	UV/thermal	Flexible, moisture-resistant
Vitalit® UD 8051	Edge sealing of control elements	11,000 - 14,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS/moisture	Dual curing, black color

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OPTICAL SYSTEMS AND LIGHT MANAGEMENT

MICRO LENS ARRAYS FOR LIGHT CARPETS (MLA)

Light carpets are a special feature that project the car brand or other designs onto the ground below the doors. This is achieved with special MLA adhesives that can diffuse the light over a large area. Uniquely formulated refractive indices are used to produce individual lens systems. Hoenle MLA adhesives are characterized by their long-term stability which provides resistance to yellowing during aging. Adhesive flow properties have also been optimized to produce customer-specific lens designs using the imprint process.



BLACK & LIGHT

Black adhesives are particularly in demand for optical and optoelectronic systems where a high optical density is required. In these applications, adhesives must minimize reflections (light shielding), or secure specific transmission values for sensors. Conventional black adhesives absorb a high percentage of the light intensity and therefore cannot be cured in thicker layers using UV light. With the new „Black & Light“ technology from Hoenle, black adhesives can now be cured in deeper layers using UV light.

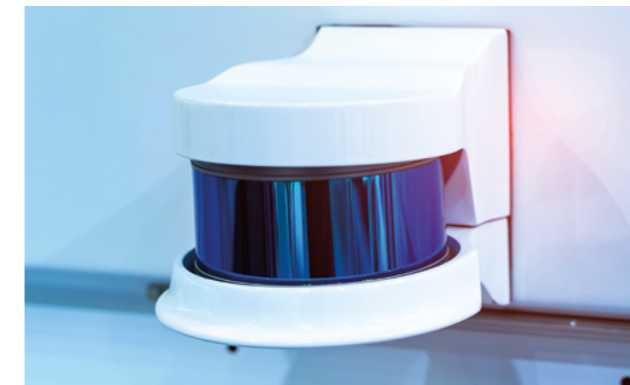
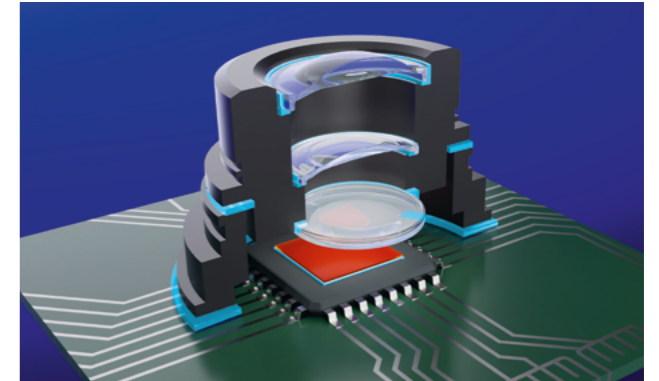
Adhesives Optical Systems	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitralit® BL UC 1101	Lens bonding Light shielding	3,500 – 7,000 Rheometer 10s ⁻¹	1-part Epoxy	UV	Light curable due to Black & Light technology, deep curing up to 1.3 mm
Vitralit® BL UC 1102	Lens bonding Light shielding	3,500 – 7,000 Rheometer 10s ⁻¹	1-part Epoxy	UV	Light curable due to Black & Light technology, OD value 4 with 0.45 mm Glop Top
Vitralit® BL UC 1103	Lens bonding Light shielding	3,500 – 7,000 Rheometer 10s ⁻¹	1-part Epoxy	UV	Light curable due to Black & Light technology, High OD values up to 6
Vitralit® UD 6574	Light blocking, protection layers lens bonding	2,000 – 4,000 LVT Sp. 4/30 rpm	1-part Epoxy	UV/thermal	Light blocking, impact resistant
Vitralit® UC 1633	Micro- and nanoimprint	170 – 230 Rheometer 10s ⁻¹	1-part Epoxy	UV	Good adhesion to various substrates, high yellowing resistance
Vitralit® UC 1658	Diffractive diffusors, MLA imprint	75 – 200 LVT Sp. 2/30 rpm	1-part Epoxy	UV	Flexible, good polymer adhesion
Vitralit® UC 6020-1 LV	Micro- and nanoimprint, wafer bonding, light carpets	500 Newtonian fluid	1-part Epoxy	UV	Transparent, high impact and temperature resistance
Vitralit® UC 6569-1 LV	Micro- and nanoimprint, mastering, light carpets	700 Newtonian fluid	1-part Epoxy	UV	High yellowing resistance, transparent
Structalit® 3060-1	Wafer level bonding, encapsulation, lens bonding	4,000 – 8,000 Rheometer 10s ⁻¹	1-part Epoxy	thermal	High mechanical flexibility, high optical stability and yellowing resistance

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OPTICAL SENSORS

CAMERA SYSTEMS | ADAS

Modern vehicles have a variety of optical sensors: cameras to assist with parking and reversing, as well as driver assistance systems and cameras to help with sign recognition, lane management, turning, and impact avoidance. These cameras are so small that mechanical fasteners cannot be used for attachment. Special adhesives, specifically matched to each substrate's properties, are utilized to bond camera housings and affix camera lenses and filters. Hoenle's unique adhesives for active alignment provide high reliability and dimensional stability. They are low-shrink adhesives with no detrimental outgassing.



LIDAR SYSTEMS

Other optical sensors used for driver assistance systems are lidar sensors. The high-performance demands placed on these systems can be enhanced with Hoenle adhesives. Stress-free, high strength bonds are required to ensure consistent sensor performance. The adhesive bonds must be highly resistant to temperature fluctuations, changes in weather, as well as salt and chemical contact. Hoenle offers an extensive line of adhesives, both acrylate and epoxy based, to meet these extreme challenges.

Adhesives Optical Sensors	Application	Viscosity [mPas]	Base	Curing*	Characteristics
Vitralit® UH 1640	Lens bonding with shadow zones	Newtonian Fluid 4,000	Acrylate/ Epoxy	UV/thermal	Flexible, low outgassing, fast light fixation
Vitralit® E-1671 T	Active Alignment with shadow zones, lens bonding	45,000 Rheometer 10s ⁻¹	Epoxy	UV/thermal	High ionic purity, low outgassing, low shrinkage
Vitralit® E-1672	Active Alignment with shadow zones	5,000 Rheometer 10s ⁻¹	1-part Epoxy	UV/thermal	Low outgassing, low shrinkage and CTE
Vitralit® 1860	Active Alignment	35,000 – 50,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS	Flexible, low shrinkage
Vitralit® UC 1870	Active Alignment	40,000 Rheometer 10s ⁻¹	1-part Epoxy	UV/VIS	Low outgassing, low shrinkage and CTE
Vitralit® UV E-2113	Lens bonding, filter bonding	25,000 – 35,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS	Flexible, low shrinkage and CTE, good glass and aluminum bonding
Vitralit® UD 5134	Lens bonding, filter bonding	15,000 – 25,000 Rheometer 10s ⁻¹	Acrylate	UV/VIS/thermal	Flexible, low shrinkage and CTE, good plastics bonding
Vitralit® E-VBB 1	Lens bonding, filter bonding	1,300 – 1,600 Rheometer 10s ⁻¹	Acrylate	UV/VIS	High mechanical flexibility, stress equalizing
Structalit® 8838 T	LBA, lens bonding	48,000 Rheometer 10s ⁻¹	Epoxy	thermal	High mechanical flexibility, tension equalizing, low outgassing

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UV CURING SYSTEMS

Hoenle offers a broad range of UV curing equipment for curing UV adhesives, which are perfectly aligned in terms of wavelength. Our sales engineers and application technicians will assist you in selecting the right UV Equipment in combination with the appropriate adhesive. Thanks to our extensive experience in both areas, we can offer you a system solution that is perfectly tailored to your individual requirements, ensuring maximum productivity and efficiency in your bonding processes.

LED SPOTLIGHTS

High intensity small area UV irradiation

BLUEPOINT



LED LINE EMITTERS

High-power arrays with individual length

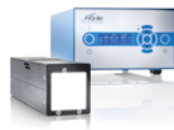
LED POWERLINE



LED FLOODLIGHTS

Homogeneous light distribution with high intensity

LED SPOT



LED CURING CHAMBER

Reliable protection against UV radiation

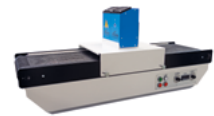
LED CUBE



LED CONVEYOR BELTS

Can be combined with LED Powerline or LED Spot for high output

CONVEY LED



UV-MEASUREMENT

Measurement of intensity and dose for reliable process monitoring

UV METER



UV Sources	Dimension in mm	Available Wavelength in nm	Intensity in mW/cm ²	Cooling
LED Spotlights	Light emission up to Ø 20	365/385/405	up to 20,000	air-cooled
LED Line Emitters	Light emission width 10/20/40, length variable	365/385/395/405/460	up to 25,000	air and water-cooled
LED Floodlights	Light emission 20x20 / 40x40 / 100x100 / 200x50	365/385/395/405/460	up to 30,000	air and water-cooled
LED Curing Chambers	Inner dimension 180x180 / 350x350	365/385/395/405/460	up to 5,000	air-cooled
LED Conveyor Belts	Belt width 110 – 520	365/385/395/405/460	up to 25,000	air and water-cooled

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