Bonding and fixing

Bonding of stator to housing

**DELO-ML DB135**
- Very high impact resistance
- Excellent media resistance (for example to oil, gasoline, Diesel)
- Normal temperature range of use up to +180°C
- Tension-equalizing: High-strength bonding of metals with dissimilar coefficients of expansion
- Immediate initial strength by light fixation; anaerobic curing of adhesive in shadowed areas

![Bonding of a steel stator to an aluminum housing](© ebm-papst)

Bonding of magnets to stator

**DELO MONOPOX** *(various structural adhesives)*
- Excellent media resistance
- Very high temperature stability
- High static and dynamic loading capacity even at elevated temperatures
- Ideal for bonding metals, temperature-resistant plastics, ferrite and ceramic
- Is used, e.g., in motors produced by the DLR (German Aerospace Center)

![Magnets bonded to a stator of space motors (© DLR) for the ISS International Space Station (© NASA)]

Bonding of rotor to shaft

**DELO-ML DB133**
- High impact resistance
- Excellent media resistance
- Tension-equalizing with an elongation at tear of 130%
- Ideal for laminar bonding
- Immediate initial strength by light fixation; anaerobic curing of adhesive in shadowed areas

![High-strength bonding of a rotor package to a shaft](© ebm-papst)

Bonding of magnets into stator housing

**DELO MONOPOX HT2860**
- High temperature stability
- Gap-filling
- Excellent media resistance (for example to oil, gasoline, brake fluid)
- Normal temperature range of use up to +220°C
- High static and dynamic loading capacity

![Bonding of magnets into the stator housing of an electric motor](© ebm-papst)
Fixing of coil wires

DELO PHOTOBOND 4497
- Dry surface
- Tension-equalizing with an elongation at tear of 200%
- Functionality: Additional mechanical protection, for example during vibration or subsequent molding

Fixing of ferrites in coils

DELO MONOPOX GE2710
- Excellent flow behavior: Adhesive capillates through the windings
- Outstanding adhesion to lacquered coil wire and ferrite
- Process reliability: Reliable fixing for further processing during the assembly process
- Also suitable for potting

Fixing of ferrites and coil bodies

DELO-DUOPOX FR898
- High-strength construction adhesive
- Excellent media resistance
- Quality: Good strength of the assembly during mechanical stress
- Functionality: Reduction of mechanical vibrations and associated noise development
- Multi-purpose
- Easy processing from side-by-side cartridges
- UL 94 V-0, E467212 (Yellow Card)

Fixing of a diode

DELO-CA 2153
- Good filling of gaps up to 0.2 mm
- Accelerated curing in combination with DELO-QUICK 2002 activator
- Multi-purpose for rubber, plastic and metal bondings
- Good adhesion to the nickel-plated surface
- Production reliability: Steady viscosity enables constant production parameters
Bonding and fixing

Bonding of coils

DELO MONOPOX SJ2981
- Run-resistant
- Normal temperature range of use up to +200°C
- Good strength on laminated copper foil and aramid foil
- High stability and strength even upon high magnetic forces

Vibration protection on PCBs

DELO-PUR 9694
- Run-resistant
- High static and dynamic loading capacity
- Functionality: Optimal vibration damping
- Multi-purpose
- Easy processing from side-by-side cartridges

Securing of soldered contacts

DELO KATIOBOND 45952
- High corrosion resistance
- Perfect solution: Preactivation enables bonding of opaque components
- Production reliability: Application control by fluorescent adhesive
- Prolonged lifetime: Reliable protection from desoldering and shocks

Fixing of SMD components

DELO MONOPOX MK096
- Low outgassing
- High corrosion resistance
- Processing on standard systems: Jetting, dispensing from cartridge, screen printing
- Suitable for high-speed processes (more than 30,000 drops/h)
Bonding of PBT cover and housing

**DELO MONOPOX GE2710**
- Good media resistance (for example to oil, gasoline)
- Excellent vibration resistance
- Very high resistance to elevated temperatures and thermal cycling test
- Multi-purpose for various plastics (such as ABS, PA, PBT)

![Bonding of the cover to the housing of an automotive control unit](image)

Bonding of displays

**DELO PHOTOBOND LA4880**
- Curing on demand
- Preactivated adhesive cures without further irradiation by humidity at room temperature
- Dry surface
- Highly flexible, soft
- Good peel resistance
- Initial strength after 1 – 2 minutes
- Final strength after 72 h

![Display frame bonding in the Center Information Display](image)

Bonding of mini speakers

**DELO PHOTOBOND UB4086**
- Temperature range of use up to +150 °C
- High temperature stability
- High impact resistance and flexibility
- Production reliability: Application control by fluorescent adhesive
- Quality: Loudspeakers bonded with DELO PHOTOBOND are characterized by excellent acoustic quality

![Bonding of mini speaker components for mobile phones](image)

Bonding of automotive cameras

**DELO DUALBOND AD345, OB786**
- Good resistance to temperature, climatic changes, humidity and in salt spray test
- Production capacity: Short cycle times by light fixation in less than 1 s
- Optimized process flow: Heat curing at only +80 °C allows the use of temperature-sensitive materials and ensures the maintenance of the adjusted optical system
- Process reliability: Steady, low shrinkage delivers high yield

![Bonding of automotive camera modules for camera-based driver assistance systems (adhesive colored magenta)](image)
Bonding and fixing

Bonding of LED reflectors and lenses

DELO KATIOBOND OB642
- Optically clear
- High yellowing resistance
- High temperature stability
- Low outgassing
- Suitable for reflow processes
- High reliability: For example for the use in headlights, flash lenses and backlighting applications

Die attach

DELO MONOPOX DA255
- High temperature resistance up to +260°C
- Fast curing in seconds with a thermode (for example 6 s @ +180°C)
- Low-tension curing
- Optimized products for many chip sizes

Flip-chip bonding

DELO MONOPOX AC268
- Good humidity resistance
- High ion purity, high corrosion resistance
- Fast curing in seconds with a thermode (for example 6 s @ +180°C)
- Multi-purpose (for example on PET, paper, FR4, PI, Cu, Al, Ag, Au)
- Anisotropic non-conductive product variants available

Bonding inkjet print heads

DELO MONOPOX GE6585 (Dam), GE6525 (Fill), DELO DUALBOND OB787, DELO KATIOBOND DI6049
- Excellent media resistance (for example to aggressive inks)
- Minimization of tensions by low CTE and curing from +80°C
- High bonding accuracy by light fixation
- Small fillers possible
- Viscosity can be set

1C epoxy 6s 10 Pa·s

Lenses bonded to LEDs

Die attach

Left: Pure leadframe
Middle: Dispensed adhesive
Right: Placed chip

Flip-chip bonding

Smart label – flip-chip bonding

Potting of flexible PCB
Bonding of nozzle plate, assembly
(Adhesive colored magenta)
Potting and coating

**Dam & Fill chip encapsulation**

DELO KATIOBOND DF698 (Dam), 4670 (Fill)
- High production capacity: Encapsulation of up to 40,000 modules/h (glob top; Dam & Fill: 20,000)
- Dam & Fill adhesives form a chemically homogeneous unit
- Functionality: High ion purity and strengths ensure the chip function over the entire lifetime
- Quality: Steady dispensing results even when using showerhead dispensers

**Opaque Dam & Fill chip encapsulation**

DELO DAM&FILL
- Production capacity: Short cycle times thanks to very fast curing
- Absolutely opaque even in thin layers; very high mechanical protection effect
  - Protection of the chip from unauthorized views, chip removal and copying

**Chip-on-board encapsulation on PCB**

DELO MONOPOX GE785 (Dam), GE725 (Fill)
- Excellent media resistance (for example to Diesel, oil, grease)
- Temperature range of use from \(-65\)°C to +180°C (modifications up to +250°C possible)
- Resistance to lead-free soldering
- Universal adhesion to standard substrates (such as FR4, PA, PPS)
- Variable curing parameters: Fast curing or low curing temperature possible

**Potting of PCBs in sensor heads**

DELO-ML DB136
- Low-viscous for good flowing into the sensor head
- Normal temperature range of use from \(-60\)°C to +180°C
- Tension-equalizing
- Immediate initial strength (after 5 s) by light fixation; anaerobic curing of adhesive in shadowed areas
- Production reliability: Application control by fluorescent adhesive
Potting and coating

Sealing of electronic housings

DELO-GUM CR3010
- Neutral crosslinking
- High flexibility from −50°C to +180°C
- Tension-equalizing
- Low water absorption
- High corrosion resistance
- Excellent for microelectronic applications

Fixing/sealing of a PCB in a housing (© viaSonic)

Sealing of microswitch pins

DELO DUALBOND GE4910
- Excellent flow and wetting behavior
- Reliable curing in shadowed areas
- Tension-equalizing
- High flexibility even at low temperatures (down to −40°C)
- Very good adhesion to metal and plastic
- Production capacity: Short cycle times thanks to very fast curing within seconds
- Longer lifetime: Resistance to humidity and thermal shock

Sealing of switches, for example for the automotive industry

Potting of sensor PCB

DELO-PUR 9691
- Tough-elastic
- Flowable, suitable for small potting applications
- Normal temperature range of use from −40°C to +125°C
- High static and dynamic loading capacity
- Easy processing from side-by-side cartridges

Potting of a PCB of a window hygrometer

Potting of electronic connectors

DELO KATIOBOND 4552
- High glass transition temperature Tg
- Good flow behavior
- Production capacity: Short cycle times thanks to very fast curing in seconds
- Suitable for rigid bonding and sealing

Potting and sealing of soldered connection contacts in the cavity of indication instruments
Corrosion protection of soldered contacts

DELO KATIOBOND KB554
- High resistance to thermal cycling test
- High corrosion resistance
- Production reliability: Application control by fluorescent adhesive
- Increased operational reliability and prolonged lifetime: Excellent wetting of the soldered contact

Potting of circuit carriers

DELO-DUOPOX CR8021
- Good flow behavior
- Low shrinkage
- Aging-resistant, permanently flexible
- Low water absorption
- High creep resistance and dielectric strength
- Multi-purpose in mechanical engineering, electrical engineering and electronics
- Easy processing from side-by-side cartridges

Potting of electronic sensor elements

DELO-DUOPOX CR8014
- Low-viscous for good flowing around the electronic assemblies
- Normal temperature range of use from −40 °C to +140 °C
- Tension-equalizing
- Aging-resistant, permanently flexible
- Bubble-free potting thanks to low viscosity
- Suitable for large potting volumes

Sensor potting

Various DELO-DUOPOX DB adhesives
- Fast initial strength by light fixation (10 – 60 s)
- Low-viscous for good flowing around the electronic assemblies
- Low shrinkage
- Aging-resistant, permanently flexible
- Tension-equalizing
- Multi-purpose in mechanical engineering, electrical engineering and electronics
# DELO’s adhesives for the electronics industry at a glance

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<tr>
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<th>DELO PHOTOBOND</th>
<th>DELO KATIOBOND</th>
<th>DELO DUALBOND</th>
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<td>1C polyurethane</td>
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<td><strong>Curing</strong></td>
<td>UV-curing,</td>
<td>UV-curing,</td>
<td>Dual-curing:</td>
<td>Anaerobic-curing, for example in 2 – 4 min (accelerated curing by DELO-QUICK activator). Special product variants are dual-curing: anaerobic-curing and light- or UV-curing</td>
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<td>UV-/light-curing,</td>
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<td>preactivated.</td>
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<td>Printed circuit boards</td>
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<td></td>
<td>Extremely fast curing</td>
<td>High thermal and media resistance</td>
<td>Secondary curing mechanism for reliable curing in shadowed areas</td>
<td>Anaerobic- and light-curing, one-component adhesives</td>
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<td></td>
<td>High equalization of tensions</td>
<td>Low outgassing</td>
<td>Low ion purity</td>
<td>Excellent adhesion to metal</td>
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<td></td>
<td>High peel resistance</td>
<td>Optically clear and yellowing-resistant even at elevated temperatures</td>
<td>Low corrosion potential</td>
<td>Good adhesion even to certain plastics</td>
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<td>High shear strength against water</td>
<td>High barrier effect against water</td>
<td>Tension-equalizing and impact-resistant</td>
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<td>Universally good adhesion</td>
<td>Bonding of opaque components by preactivation</td>
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* The strong points show in which areas the product groups are particularly efficient. Depending on the product, these strong points may differ.

## Satisfied customers

### DELO MONOPOX
- 1C epoxy
- Heat curing, depending on the product in the range from +60 to +180 °C

### DELO-DUOPOX
- 2C epoxy
- 5.5 h initial strength
- At room temperature after mixing resin and hardener, for example initial strength after 5.5 h (products with fixation times from 15 min to 8 h available). Special product variants are light-fixable (light fixation in 10 s – 60 s)

### DELO-PUR
- 2C polyurethane
- 1.5 h initial strength
- At room temperature after mixing resin and hardener, for example initial strength after 1.5 h (products with fixation times from 30 min to 7 h available)

### DELO-GUM
- 1C silicone
- By air humidity at room temperature, for example initial strength after 30 s (accelerated curing by DELO-QUICK 2002 activator)

### DELO-CA
- Cyan-acrylate
- 30 s initial strength
- By air humidity at room temperature

<table>
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<tr>
<th>Application areas</th>
<th>Curing</th>
<th>Basis</th>
<th>Special features</th>
<th>DELO PHOTOBOND</th>
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- Automotive
- Electric motors
- Magnet bonding
- Smart labels
- Smart cards
- Printed circuit boards
- Microelectronic packaging
- Potting

- High thermal and media resistance
- High strength even at elevated temperatures
- Good adhesion to many metals and plastics
- Wide property variety (for example high $T_p$, low CTE, curing at low temperatures from +60 °C)

<table>
<thead>
<tr>
<th>Numeric product key</th>
<th>All products are</th>
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<tr>
<td>AC = Anisotropic Conductive</td>
<td>solvent-free</td>
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<td>AD = Adhesive</td>
<td>compliant with RoHS Directive 2015/863/EU</td>
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<td>CR = Casting Resin</td>
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<td>DA = Die Attach</td>
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<tr>
<td>DB = Dual Bonding</td>
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<td>DF = Dam &amp; Fill</td>
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<td>DI = Dual Initiator</td>
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<td>FR = Flame-Retardant</td>
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<td>LA = Light-Activated</td>
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<td>GE = General Encapsulant</td>
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<td>HT = High Temperature</td>
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<td>KB = KATIOBOND</td>
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<td>OB = Optical Bonding</td>
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<td>SJ = Structural Joining</td>
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<td>UB = Universal Bonding</td>
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Many products are halogen-free according to or by the criteria of IEC 61249-2-21. Details can be found in the specific Technical Data Sheet.
The data and information provided are based on tests performed under laboratory conditions. Reliable information about the behavior of the product under practical conditions and its suitability for a specific purpose cannot be concluded from this. It is the customer’s responsibility to test the suitability of a product for the intended purpose by considering all specific requirements and by applying standards the customer deems suitable (e.g. DIN 2304-1). Type, physical and chemical properties of the materials to be processed with the product, as well as all actual influences occurring during transport, storage, processing and use, may cause deviations in the behavior of the product compared to its behavior under laboratory conditions. All data provided are typical average values or uniquely determined parameters measured under laboratory conditions. The data and information provided are therefore no guarantee for specific product properties or the suitability of the product for a specific purpose. Nothing contained herein shall be construed to indicate the non-existence of any relevant patents or to constitute a permission, encouragement or recommendation to practice any development covered by any patents, without permission of the owner of this patent. All products provided by DELO are subject to DELO’s General Terms of Business. Verbal ancillary agreements are deemed not to exist.

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