Bonding in Electronics
Design Examples and Product Range

Sealing of microswitch pins
**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 firmness to touch by light fixation; anaerobic curing of adhesive in shadowed areas

![Image of bonding of stator to housing](image1)

**Bonding of magnets to stator**

**DELO MONOPOX AD295**
- 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 in all motors produced by the DLR (German Aerospace Center)

![Image of magnets bonded to stator](image2)

**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 firmness to touch by light fixation; anaerobic curing of adhesive in shadowed areas

![Image of bonding of rotor to shaft](image3)

**Bonding of magnets into stator housing**

**DELO MONOPOX AD289**
- High impact resistance
- Gap-filling
- Excellent media resistance
  (for example to oil, gasoline, brake fluid)
- Normal temperature range of use up to +200 °C
- High static and dynamic loading capacity

![Image of bonding of magnets into stator housing](image4)
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 6093
- 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 DELO-AUTOMIX cartridges
- UL 94 V-0, E467212 (Yellow Card)

Bonding of ferrites

DELO-ML 5327
- Temperature range of use from ~60 °C to +200 °C
- Accelerated firmness to touch in less than 20 s with DELO-QUICK activator
- High strength: Component failure in mechanical test
- Functionality: Excellent vibration resistance and damping
Bonding and fixing

Bonding of coils

DELO MONOPOX AD297
- Run-resistant
- Tough-hard
- 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 DELO-AUTOMIX cartridges

Securing of soldered contacts

DELO KATIOBOND 45952
- High peel resistance
- 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
- High wet strength
- Low outgassing
- High corrosion resistance
- Processing on standard systems, for example from Camalot or Asymtek: Jetting, dispensing from cartridge, stencil printing
- Suitable for high-speed processes (more than 30,000 drops/h)
Bonding of PBT cover and housing

DELO MONOPOX 6093
- Good media resistance (for example to oil, gasoline)
- Excellent vibration resistance
- Very high resistance to elevated temperatures and temperature cycling
- Multi-purpose for various plastics (such as ABS, PA, PBT)

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 of miniloudspeakers

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 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 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

![Lenses bonded to LEDs](image)

Die attach

DELO MONOPOX DA375
- Good electrical and thermal properties
- High temperature resistance up to +260 °C, for lead-free soldering processes
- Fast curing in seconds with a thermode (for example 8 s @ +150 °C)
- Low-tension curing
- Products tested according to JEDEC MSL for reasonably priced storage
- Optimized products for many chip sizes

![Leadframe, Dispensed adhesive, Placed chip](image)

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

![Smart label – flip-chip bonding](image)

Bonding inkjet print heads

DELO MONOPOX GE785 (Dam), GE725 (Fill), DELO DUALBOND OB787
- Excellent media resistance (for example to aggressive inks)
- Minimization of tensions by low CTE and curing at +80 °C
- High bonding accuracy by light fixation
- Small fillers possible
- Viscosity can be set

![Potting of flexible PCB, Bonding of nozzle plate, assembly (adhesive colored magenta)](image)
Potting and coating

Bonding of touch panel displays

DELO DUALBOND (various products)
- High transparency
- Tension-equalizing
- Low shrinkage
- Secondary curing mechanism for shadowed areas, for example under black print on the glass cover
- Quality: Increased ruggedness, impact and vibration resistance of touch panel and display

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 and coating

Sealing of electronic housings

DELO-GUM SI480
- 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 temperature shocks

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 DELO-AUTOMIX cartridges

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 temperature cycling
- High corrosion resistance
- Production reliability: Application control by fluorescent adhesive
- Increased operational reliability and prolonged lifetime: Excellent wetting of the soldered contact

**Potting of electronic sensor elements**

**DELO-DUOPOX CR804**
- 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

**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 firmness to touch (after 5 s) by light fixation; anaerobic curing of adhesive in shadowed areas
- Production reliability: Application control by fluorescent adhesive
DELO’s adhesives for the electronics industry at a glance

<table>
<thead>
<tr>
<th>Basis</th>
<th>DELO PHOTOBOND</th>
<th>DELO KATIOBOND</th>
<th>DELO DUALBOND</th>
<th>DELO-ML</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1C acrylate</td>
<td>1C epoxy</td>
<td>mod. 1C acrylate</td>
<td>Meth- acrylate</td>
</tr>
<tr>
<td>Curing</td>
<td>UV-curing, light-curing, for example within 8 s</td>
<td>UV-curing, UV-/light-curing, light-activated, for example within 9 s</td>
<td>Dual-curing: light-curing and heat- or humidity-curing depending on the product</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>
</tr>
<tr>
<td>Application areas</td>
<td>Automotive</td>
<td>Mobile phones</td>
<td>Displays</td>
<td>Optoelectronics</td>
</tr>
<tr>
<td>Special features *</td>
<td>Extremely fast curing</td>
<td>High equalization of tensions</td>
<td>High peel resistance</td>
<td>High optical clearness and UV resistance</td>
</tr>
</tbody>
</table>

* 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**
- 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 $T_g$, low CTE, curing at low temperatures from +80°C)

**DELO-DUOPOX**
- Automotive
- Electric motors
- Tool and plant construction
- Printed circuit boards
- Potting
- High thermal and media resistance
- High shear strength on metal and certain plastics
- Partly excellent peel resistance on smooth surfaces
- Products with dissimilar curing speeds available

**DELO-PUR**
- Automotive
- Electric motors
- Tool and plant construction
- Printed circuit boards
- Potting
- High strength and good elasticity
- High peel resistance
- Products with dissimilar curing speeds available

**DELO-GUM**
- Automotive
- Electric motors
- Tool and plant construction
- Printed circuit boards
- Potting
- Permanently flexible
- Very good aging resistance
- Very wide temperature range of use

**DELO-CA**
- Automotive
- Tool and plant construction
- Printed circuit boards
- Especially for fast fixing of components
- Universal adhesion to metals, ceramic, many plastics and elastomers

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**Numeric product key**
- AC = Anisotropic Conductive
- AD = Adhesive
- CR = Casting Resin
- DA = Die Attach
- DB = Dual Bonding
- DF = Dam & Fill
- FR = Flame-Retardant
- GE = General Encapsulant
- KB = KATIOBOND
- MK = MONOPOX Klebstoff
- OB = Optical Bonding
- SI = Silicone
- UB = Universal Bonding

**All products are**
- solvent-free
- compliant with RoHS Directive 2015/863/EU

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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